Exploration and Mining Guide for Aboriginal Communities

Government of Canada | Gouvernement du Canada

Information contained in this publication or product may be reproduced, in part or in whole, and by any means, for personal or public non-commercial purposes, without charge or further permission, unless otherwise specified.

You are asked to:
- exercise due diligence in ensuring the accuracy of the materials reproduced;
- indicate the complete title of the materials reproduced, and the name of the author organization;
- indicate that the reproduction is a copy of an official work that is published by the Government of Canada and that the reproduction has not been produced in affiliation with, or with the endorsement of, the Government of Canada.

Commercial reproduction and distribution is prohibited except with written permission from the Government of Canada's copyright administrator, Public Works and Government Services Canada (PWGSC). For more information, contact PWGSC at 613-996-6886 or at copyright.droitdauteur@pwgsc-tpsgc.gc.ca.

© Her Majesty the Queen in Right of Canada, 2013

Cat. No. M37-54/2012E (Print)
ISBN 978-1-100-21429-0

Cat. No. M37-54/2012E-PDF (On-line)
ISBN 978-1-100-21430-6

This Guide is also available on the Internet at:
PDAC: www.pdac.ca
MAC: www.mining.ca
CAMA: www.aboriginalminerals.com
AANDC: www.aadnc-aandc.gc.ca/eng/1100100034828/1100100034832
NRCan: www.nrcan.gc.ca/minerals-metals/aboriginal/bulletin/3059

Cette publication est aussi disponible en français sous le titre
Guide sur l'exploration et l'exploitation minières pour les communautés autochtones

MINERAL EXPLORATION | **MINE DEVELOPMENT** | MINE OPERATION | MINE CLOSURE

Note to Reader: This Guide has been prepared on the basis of information available at the time of writing. The project partners make no warranty of any kind with respect to the content and accept no liability, either accidental, consequential, financial or otherwise, arising from the use of this document.

PREFACE

The original *Mining Information Kit for Aboriginal Communities*, which this document updates and replaces, was published in 2006. It was a partnership project between the Minerals and Metals Sector of Natural Resources Canada, Aboriginal Affairs and Northern Development Canada, The Mining Association of Canada, the Prospectors and Developers Association of Canada, and the Canadian Aboriginal Minerals Association.

This revised Guide was developed by reviewing user feedback on the 2006 version and through a process involving an advisory committee. The advisory committee comprised the original partners of the *Mining Information Kit for Aboriginal Communities* and representatives of Aboriginal organizations, mining industry, civil society, government, and academia.

It is designed to be used as a complementary tool to existing instruments and as a living document.

TABLE OF CONTENTS

INTRODUCTION vi

1. MINERAL EXPLORATION 1

1.1 What Is Mineral Exploration? 2

1.2 What Are the Stages of Mineral Exploration? 4

1.3 Who Are the Main Players in Mineral Exploration? 10

1.4 Acts and Regulations 12

1.5 Environmental and Social Impacts 13

1.6 How Can Aboriginal Communities Get Involved in Mineral Exploration? 16

1.7 Community Employment and Other Economic Opportunities 18

1.8 Community Experiences: Athabasca Basin Development Limited Partnership 21

2. MINE DEVELOPMENT AND CONSTRUCTION 23

2.1 What Is Mine Development? 24

2.2 What Are the Mine Development Activities? 25

2.3 Who Are the Main Players in Mine Development? 30

2.4 Acts and Regulations 30

2.5 Environmental and Social Impacts 32

2.6 How Can Aboriginal Communities Get Involved in Mine Development? 37
2.7 Community Employment and Other Economic Opportunities 38
2.8 Community Experiences: Nuna Group of Companies 44

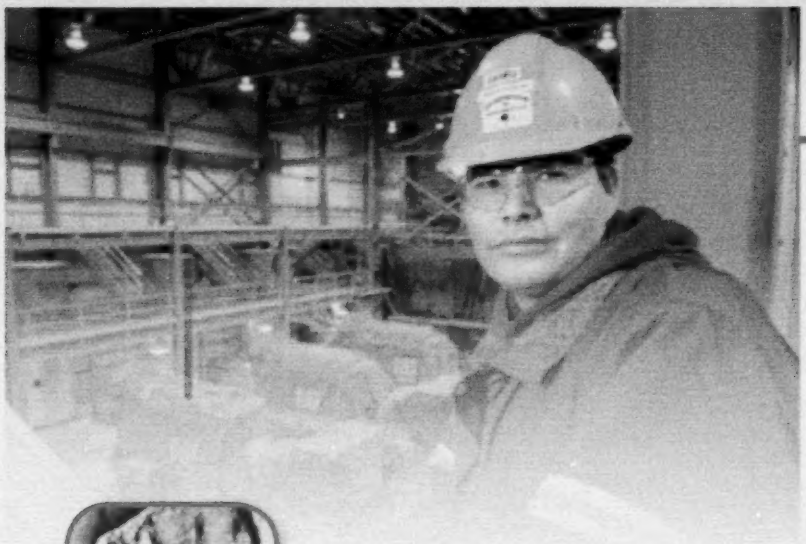
3. MINE OPERATION 47
3.1 What Is Mine Operation? 48
3.2 What Are the Mine Operation Activities? 50
3.3 Who Are the Main Players in Mine Operations? 52
3.4 Acts and Regulations 53
3.5 Environmental and Social Impacts 54
3.6 How Can Aboriginal Communities Get Involved in Mine Operation? 57
3.7 Community Employment and Other Economic Opportunities 58
3.8 Community Experiences: Diavik Diamond Mine 62

4. MINE CLOSURE AND RECLAMATION 65
4.1 What Is Mine Closure? 66
4.2 What Are the Mine Closure Activities? 68

4.3 Who Are the Main Players in Mine Closure? 70
4.4 Acts and Regulations 71
4.5 Environmental and Social Impacts 72
4.6 How Can Aboriginal Communities Get Involved in Mine Closure? 75
4.7 Community Employment and Other Economic Opportunities 75
4.8 Community Experiences: Polaris Mine Closure 77

GLOSSARY 81

ADDITIONAL RESOURCES 85



INTRODUCTION

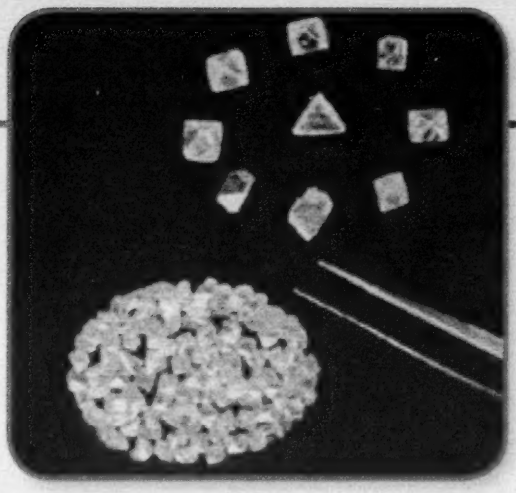
To varying degrees, the recovery and use of minerals have always been an important part of Aboriginal culture.

Welcome to the second edition of the *Exploration and Mining Guide for Aboriginal Communities*.

Society relies on mines to provide the minerals and metals needed to make the things we use every day such as trucks, all-terrain vehicles, boats, and houses. Products made from the mining of minerals and metals are easily identified in our daily lives. The copper wiring in our homes, the nickel in our stainless steel sinks, the gypsum in our walls, the silica in our glass windows, and the salt we use on our food all come from the mining of minerals and metals from the earth. In addition, a variety of other metals such as zinc, silver, gold, platinum group metals, and the rare earth elements are used to make many parts of our cars and components in household electronic equipment such as computers, stereos, and televisions.

Mining has been a part of Aboriginal communities and economies for generations. Not only did Aboriginal peoples make use of rocks, but they also recovered materials from these rocks that had a variety of uses as tools, weapons, and decorative objects. They mined rocks for native copper, flint, chert, salt, soapstone, obsidian, and ochre to name a few, and traded these materials using an extensive trade network throughout the Americas. Copper was used in the making of spear points for fishing and harpoons. Flint was used for starting fire and the manufacturing of knives, scrapers, spear points, and arrowheads. Red ochre was used in rock paintings, known as pictographs, to tell stories of spiritual beings, sacred encounters, and lessons for future generations. To varying degrees, the recovery and use of minerals have always been an important part of Aboriginal culture.

Exploration and mining activities can make a significant contribution to the prosperity and well-being of Aboriginal communities. Many Aboriginal communities are located near exploration projects and producing mines in Canada. Reliance on natural resources, including mineral resources, constitutes the primary driver for socio-economic development and regional economic diversification for many Aboriginal communities. Mineral exploration provides the possibility of employment and skills development



depending on the stage of the project. With good planning, a mine can generate benefits that outlive the mine itself and build the community's self-reliance.

Canada is one of the largest mining nations in the world, producing more than 60 minerals and metals. Currently, the provinces and territories are responsible for mining within their jurisdictions, with the exception of Nunavut, the Northwest Territories, and Indian Reserves, where it rests with the federal government through Aboriginal Affairs and Northern Development Canada (AANDC). The federal government shares jurisdiction on some related matters (e.g., taxation and the environment) and has exclusive jurisdiction over areas such as exports, foreign investment controls, and nuclear matters. Exploration and mining are occurring in every region of the country, and the young and growing Aboriginal population stands to benefit from mining-related activities from coast to coast.

Goal of This Guide

The goal of this guide is to increase the ability of Aboriginal peoples to understand the mineral development cycle and participate in exploration and mining-related activities. The information is organized into four sections that match the main phases of the mineral development cycle: Mineral Exploration, Mine Development and Construction, Mine Operation, and Mine Closure and Reclamation. The sections can be presented together or used separately on a stand-alone basis. A glossary of terms is included to provide definitions for words that are bolded in the text.

Within each of the four sections are eight common sub-sections as follows:

1. **What Is . . . ?** This sub-section describes the purpose of each phase of the mineral development cycle;

2. **What Are the Activities?** This sub-section provides a detailed explanation of the activities and processes, and when and where they occur;

3. **Who Are the Main Players?** This sub-section provides a list of who is involved and a short description of their potential roles and responsibilities;

Exploration and mining are occurring in every region of the country, and the young and growing Aboriginal population stands to benefit from mining-related activities from coast to coast.

4. **Acts and Regulations:** This sub-section identifies the general regulatory requirements, laws, and licences and permits that apply during each phase of the mineral development cycle;

5. **Environmental and Social Impacts:** This sub-section identifies the possible impacts of the activity and provides ideas for reducing and monitoring them;

6. **How Can Aboriginal Communities Get Involved?** This sub-section describes the methods of community participation and involvement during each phase, and provides a series of best practice tools and tips for communities to stay informed, participate, and become involved;

7. **Community Employment and Other Economic Opportunities:** This subsection identifies the many different economic and business opportunities that may be available to Aboriginal communities; and

8. **Community Experiences:** This sub-section provides examples of strategies and success stories of Aboriginal communities engaged in mining.

Digging Further

From start to finish, the mineral development cycle can take a very long time. Work in each phase can take many years to complete and can cost hundreds of millions of dollars. Each stage may lead into the next, meaning the next stage will not be started unless work in the previous stage brought positive results. It is easy to say that exploration is "results-driven" because if positive results are not achieved, a project may not continue on to the next phase. Once a mineral resource has been identified, many factors determine whether or not that resource will ever be mined, including the price of the mineral on international markets. Most exploration projects never make it past advanced exploration. In fact, the odds of a mineral deposit ever becoming a mine are very low, estimated to be about 1 in 10 000.

Environmental Considerations

Industry and governments are committed to ensuring that mineral development in Canada is conducted in an environmentally responsible way in all phases of the mineral development cycle. The Green Mining Initiative (GMI), under the collaborative leadership of Natural Resources Canada (NRCan), brings together stakeholders to develop green technologies, processes, and

knowledge for sustainable mining. The vision of the GMI is to develop the innovation required for mining to leave behind only clean water, rehabilitated landscapes, and healthy ecosystems. The GMI's objectives are to improve the mining sector's environmental performance, to promote innovation in mining, and to position Canada's mining sector as the global leader in green mining technologies and practices.

While many of its activities are regulated and many individuals and companies are developing their own corporate social responsibility applications, the Canadian mineral industry has adopted voluntary measures to ensure a safe and healthy environment:

- The Prospectors and Developers Association of Canada (PDAC) has developed *e3Plus: A Framework for Responsible Exploration*, which includes a toolkit entitled "Environmental Excellence in Exploration." It offers practical guidelines on exploration activities and environmental practices (www.pdac.ca/e3plus).

- The Mining Association of Canada's (MAC) Toward Sustainable Mining (TSM) initiative requires that all MAC members measure and report on a number of environmental and social performance indicators. The results are verified by independent third parties and the entire program is informed by a Community of Interest Panel that includes representation from a broad cross-section of civil society, including Aboriginal communities and non-governmental organizations (www.mining.ca).

Economic opportunities for communities exist at each phase of the mineral development cycle.

Economic Development

Economic opportunities for communities exist at each phase of the mineral development cycle. These can include: prospector or geological assistant field work, core sample preparation, digging and trenching with heavy equipment, and the provision of catering and accommodation services during exploration; direct employment at the mine during construction and operation; and spin-off opportunities such as transportation, road maintenance, and environmental monitoring beyond the life of the mine. Each Aboriginal community is unique and will be equipped differently to identify and capture possible economic opportunities.

Traditional Knowledge

During all phases of mineral development, traditional knowledge is an area where Aboriginal community

input is important. Traditional knowledge provides information about traditional land uses, alerts explorers and developers to migratory patterns of wildlife, and informs them about sensitive areas (hunting areas, cultural sites, migratory routes, etc.). It can also be used in environmental assessments to determine the activity's environmental impacts and evaluate how serious they may be.

Relationships and Partnerships

Aboriginal-industry relationships and partnerships have evolved tremendously through the conclusion of agreements at various phases of the mineral development cycle, which have proven to be successful in securing benefits for some Aboriginal communities or groups and for mining companies. The types of agreements vary by community, jurisdiction, and stage of the project. At the exploration stage, exploration agreements, memoranda of understanding, or letters of intent may be signed as a way to create a protocol between a community and an exploration company and to define principles for working together. An important distinction between exploration and producing (mining) companies is the lack of a revenue stream for exploration companies.

At the mining development stage, more formal agreements are negotiated, such as an Impact and Benefit Agreement (IBA), that contain provisions for employment and training, business opportunities through set-aside contracts and joint ventures, social and cultural considerations, funding arrangements, and other provisions.

1 MINERAL EXPLORATION

1.1 What Is Mineral Exploration?

1.2 What Are the Stages of Mineral Exploration?

1.3 Who Are the Main Players in Mineral Exploration?

1.4 Acts and Regulations

1.5 Environmental and Social Impacts

1.6 How Can Aboriginal Communities Get Involved in Mineral Exploration?

1.7 Community Employment and Other Economic Opportunities

1.8 Community Experiences: Athabasca Basin Development Limited Partnership

1 MINERAL EXPLORATION

The exploration phase starts with identifying large areas that may contain valuable mineral deposits.

This section explains the purpose of mineral exploration, identifies the main activities and players, and outlines opportunities for Aboriginal communities to get involved during exploration.

1.1 What Is Mineral Exploration?

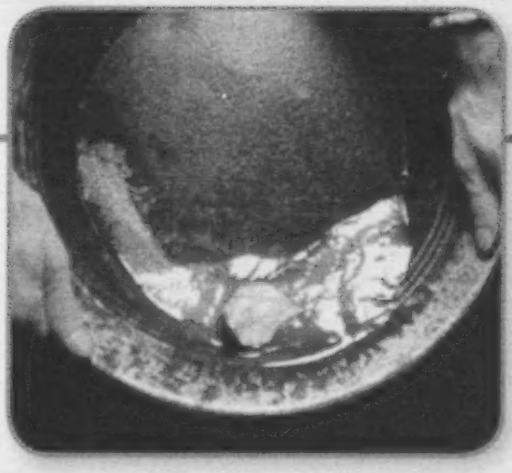
Mineral exploration is the first phase of the mineral development cycle: it is the search for mineral deposits. The purpose of exploration is to locate a new source of metal or useful minerals that can be economically mined. This includes industrial minerals (such as silica used in the making of glass, or clay minerals used in the making of ceramics), iron and base metals (such as lead, zinc, and copper), rare earth elements used in high technology, and precious metals and gemstones (such as gold, platinum, and diamonds). It takes many stages of successful exploration work, involving increasing investments, to discover a mineral deposit and turn it into a producing mine (see sub-section 1.2 for a description of the phases). This means that most projects will only undergo limited exploration.

Exploration can occur in many different places. It can take place in an area where minerals have not been found before (grassroots exploration) or near operating or closed mines (brownfield exploration). Exploration can also occur on an active mine-site property to expand a mineral resource that has been found and developed, or on properties previously explored, but using new approaches and technologies.

The exploration phase starts with identifying large areas that may contain valuable mineral deposits. This early work typically involves reviewing maps (e.g., geological maps), surveys, reports, and assessment files available from provincial/territorial and Canadian geological surveys or universities.

Success Rates

Every new mine has its beginnings as an exploration project. However, most exploration projects will not advance to become mines. The success rate is extremely low for prospecting and early exploration projects. A prospector would be very fortunate to find one area that will become a mine in his or her lifetime. Fewer than 1 in 10 000 mineral **showings** discovered actually become a mine.



Time Frames

Exploration is a very slow and methodical process. For exploration programs where a promising mineral showing has been discovered, it will usually take at least 7 to 10 years before the start of a new mine. In some cases, it can take longer depending upon a number of factors, including the willingness of investors to advance the money to explore more fully over the years. A property can be explored many times, by different companies, without success. At any time, the exploration company or its investors may find that the potential rewards are no longer worth their investment. They may give up the project, sell the property to another company (properties can change ownership many times during exploration), or choose to hold the property until market conditions improve or economics justify further exploration.

Exploration Financing

During exploration, smaller junior exploration companies or groups of prospectors finance projects solely from private investors or through the stock market. In Canada, they typically raise money through the Toronto Stock Exchange (TSX and TSX Venture exchanges). There are restrictions on how the money they raise can be spent. Exploration companies and prospectors, unlike large mining companies, have no operating mines and no other sources of income. They are entirely dependent on the capital markets for obtaining funds for exploration projects.

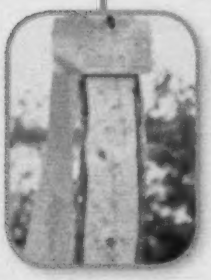
Larger (senior or major) companies also conduct exploration programs, and these typically focus on expanding mineral resources at existing mines. They also raise money on the stock market and they use the profits from their mining operations to fund exploration activities or to acquire properties from prospectors or junior companies.

Facts and Figures

Companies may be private-sole proprietorships (prospectors) or public companies. A private company raises money from private investors who are willing to take a high-risk investment. A public company raises money for its exploration programs by selling shares to the public via stock exchanges (such as the Toronto Stock Exchange).

Facts and Figures

The success rate is extremely low for "grassroots" exploration. Fewer than 1 in 10 000 mineral showings discovered actually become a mine.



1.2 What Are the Stages of Mineral Exploration?

Prospecting and Early Exploration

A very low-impact activity, prospecting, is the initial search for mineral showings and possible deposits. It usually takes place in the summer when there is little to no snow cover. It is highly competitive and therefore a very secretive activity until the prospector has secured the **mineral rights**.

All provinces and territories in Canada require some form of licence in order to acquire mineral rights . . .

Prospecting and early exploration activities can take many forms from a prospector walking through the bush with a rock hammer and a backpack to a prospector using simple geophysical tools. The activities also include examining and collecting rocks and soil samples by hand for either mineral or chemical analysis.

Basic geoscience surveys, such as geological mapping and satellite coverage, help guide the search for mineral deposits of economic value. Federal, provincial, and territorial geological surveys do most of the mapping in Canada. Prospectors and geologists use geological maps to locate the best areas to explore for minerals that could lead to a mine. Good geological maps can greatly reduce the search time.

During prospecting and early exploration, community members may notice increased activity in the area, as well as plane and helicopter activities. In some areas, airborne geophysics is conducted and involves peculiar-looking fixed-wing aircraft, or helicopters towing a "bird," which fly in a grid pattern. This may be the most obvious first sign that an area is of interest to explorers. If there are no towns or other facilities near the exploration area, a small exploration camp is usually set up. The camp may consist of a few wall tents or trailers, and may be in place for a few seasons depending on the length of the prospecting and early exploration activities and the number of people working on the project. For camps in remote areas, small aircraft may bring in supplies, take out samples, and transport prospectors and crew.

These activities do not mean that a mine is going to be developed but, rather, that there are people searching for signs of economic metals and minerals.

Acquisition of Mineral Rights/ Claim Staking

If a prospector makes a promising find, he/she will want to acquire the mineral rights or "stake claims." All provinces and territories in Canada require some form of licence in order to acquire

mineral rights, which can usually be obtained at a mining recorder's office.

Once claims are staked and the mineral rights are acquired, the prospector or company has the exclusive right to explore that piece of ground for a certain period of time. This does NOT mean that the prospector or exploration company owns the land; it just means that no one else can conduct exploration work or proceed to develop a mine on these staked lands.

To keep claims in good standing, a minimum amount of work (**expenditures**) must be done and assessment reports must be given to the appropriate government body. These assessment reports show the results of the work done by the prospector or company. They can be viewed by the public through the provincial, territorial, or federal mine offices with this responsibility. If no money is spent on the staked land within a given time frame, the claim will expire and the mineral rights will return to the Crown. At this point, someone else can re-stake the land. Each **jurisdiction** has rules about what exploration is allowable as an expense towards the assessment credit to retain the mineral rights.

Where Can a Claim Be Staked?

Any area of open **Crown land** can be staked, including land traditionally used by Aboriginal peoples and communities. Crown land is administered and regulated by governments, and includes both surface and mineral/**sub-surface rights**. Mineral rights on more than 90% of Canada's land are currently owned by governments. Governments will lease the mineral rights to individuals and companies provided they meet certainconditions and obligations.

In addition to Crown land, under certain circumstances (usually involving some prior notification), staking and prospecting may be allowed where the surface land is privately owned, but where the mineral rights are owned by the Crown. Private land is any land owned by private individuals or corporations rather than the Crown.

Areas that are generally not open for mineral rights acquisition can include:

- Land in a registered plan, sub-division, or town site;
- Parks or other protected areas;
- Land already staked by another prospector or mining company; and
- Land occupied by a building or a residence.

Facts and Figures

Any area of Crown land not specifically protected from mining development, including land traditionally used by Aboriginal peoples, can be staked.

Land on Indian Reserves cannot be staked, except in Quebec and British Columbia where claim-staking is required even on Reserve land in order to acquire exploration rights.

The pattern of rights to minerals on Indian Reserves is complicated and varying, both between provinces and within provinces. In most cases, work is governed by the Indian Mining Regulations (see Additional Resources and Reading at the end of this Guide for the link). In some cases, provincial regulations are applied.

In some parts of Canada (e.g., Nunavut), Aboriginal peoples own both the surface and mineral rights, based on land claim and self-governing agreements. These agreements may contain specific guidance on mining activities.

How Can a Claim Be Staked?

There are different ways to stake a claim and acquire mineral rights. In some jurisdictions, **mineral claims** are acquired by physically staking the claims in the field. Claim posts are erected or cut from existing trees to mark the boundary of the ground to be explored, and claim tags are put on the posts for identification. The claim must then be filed at the mining recorder's office, along with a map showing the claim post boundaries, and a registration fee must be paid.

In some provinces (e.g., British Columbia, Quebec, Newfoundland and Labrador, and New Brunswick), claim acquisition is done using an electronic, web-based system that allows people and/or companies to acquire mineral rights by selecting a claim on an electronic map over the Internet rather than by staking a claim on the ground.

Closure and Rehabilitation of Early Exploration Sites

Prospecting and early-stage exploration work is a passive activity, mainly involving the collection of samples or geophysical readings, with very minimal impact on the environment and communities. If the project does not move to the next stage of exploration, the site will be **rehabilitated** and the equipment will be removed. There are usually no significant long-term impacts on the land resulting from early exploration work.

Intermediate Exploration

Most exploration projects will not advance to this stage. If the results from the previous stage are positive such that the company can justify additional expenditures to investors and partners to advance the project, more detailed exploration will be undertaken. At this stage, the community may notice increased work on the ground and helicopters or small airplanes carrying

special instruments. Key activities in this stage are described below.

Geophysical Surveys, Trenching, Channel Sampling, Geochemical Sampling, Line Cutting

Many mineral or metal deposits cannot be seen from the surface, but are buried beneath soil, glacial **tills**, sediments known as "overburden," or other rock formations. In order to test if minerals or metals are present beneath the surface, advanced techniques are used, such as **geophysical surveys** and core/diamond drilling. To prepare for this work, a grid is created on the land marked by narrow cut-lines in the forest or by a line of pickets on open land. This type of activity is often referred to as "line-cutting." Once this grid has been completed, geophysical instruments can be carried along the grid to conduct detailed geophysical surveys and other more detailed work, including geological mapping or trenching (cutting or digging a long ditch in the ground to examine the geology beneath the surface).

Sampling and Drilling

During the intermediate exploration stage, geophysical anomalies may be tested by diamond drilling, or larger and more representative samples of a mineral occurrence may be collected. This will help the exploration company estimate the extent and shape of the mineralized zone. A diamond drill has a circular diamond-studded bit that is used to cut through rock for up to one kilometre or more and recover cylindrical samples of rock, called "drill core," generally of about four to five centimetres in diameter. Drill core looks like a solid rod made of rock and resembles a fat broom handle. Drilling is a large financial investment for a company. The cost per metre drilled (typically several hundreds of dollars per metre once all costs are accounted for) depends on the location of activity, the type of rock being drilled, the diameter of the hole, and the type of drill being used. The cost of a drilling program for one season can be over $100 000 to as much as $1 million or more for a larger project. Drill core samples are sent to a laboratory to be analyzed for their mineral content. If the results show good **grades** for the desired metal or mineral, a larger drilling program could be undertaken to better define the overall size and grade of the mineral deposit.

Environmental Baseline Work

Although environmental baseline studies are normally done during the advanced exploration stage, companies are encouraged to do

Facts and Figures

As the exploration project advances, the community may notice not only increased work on the ground, but also a helicopter or airplane carrying special antennas or instruments pulled through the air. There may also be increased economic benefits for the communities with respect to employment and business opportunities.

some environmental baseline work during the intermediate exploration period. These are studies of soil and vegetation types, wildlife, and water analysis. These studies could include collecting water samples for testing, or identifying cultural areas that are to be respected and avoided when necessary. The background data provide a reference point that can be used to measure the impacts of a project over time and, if the project goes ahead to the next phase, the data can be used in the environmental assessments. Traditional knowledge and traditional land-use studies are also useful during exploration programs.

Preliminary Evaluation of the Deposit

During and after the field work, the company carefully reviews the results of the surveys, sampling, and drilling to determine if the mineral deposit has the potential to become a mine and if further exploration, which will require more extensive activities and expenditures, is worthwhile. Typically, the company will have an independent consultant produce a preliminary economic assessment (or scoping study) at this stage to provide an early indication of economic potential. In many cases, however, this initial evaluation will lead to a conclusion that the deposit is not significant enough to develop further and the exploration project will cease.

Closure and Rehabilitation of Exploration Site

If the project does not extend beyond this stage, the company will decommission and rehabilitate the area according to the conditions attached to approvals and the various licences and permits. In addition to legal requirements, companies are encouraged to refer to industry's guidance on environmental stewardship in exploration. For more information, consult the Environmental Stewardship Toolkit of *e3 Plus: A Framework for Responsible Exploration* (www.pdac.ca/e3plus).

These practices may include:

- Ensuring the excavated areas are backfilled and the drill holes are capped or plugged;
- Removing camps, **waste**, and redundant equipment from the area; and
- **Reclamation** of the areas disturbed by exploration activities.

Advanced Exploration

If the intermediate stage of exploration leads to positive results, the project can move to advanced exploration.

Other factors such as metal prices and the ability of the company to obtain additional financing will influence the decision to move forward. Activities will involve more field work and additional drilling, and may also include getting larger samples of rock for analysis (**bulk sampling**), perhaps from underground in rare cases.

Bulk Sampling

Bulk sampling means removing a large amount of rock for sampling and testing purposes. This sampling provides large and representative mineralized samples (may be up to 10 000 tonnes, but typically are in the 100- to 200-tonne range) that will be processed to analyze the **metallurgical** characteristics to determine whether the mineral of value can be economically recovered from the mineral deposit. The sample is usually shipped off-site to a specialized laboratory for testing, although crushing is sometimes done on-site to facilitate shipping.

Environmental Work

Environmental work continues at this stage, along with the other field activities. This work is important for advanced exploration projects as companies will use this baseline information in a more comprehensive environmental assessment that is required by law to develop a mine. The earlier the company starts collecting these data, the better. In some jurisdictions, an environmental assessment may include a social impact assessment.

Pre-Feasibility

Pre-feasibility studies, including engineering pre-design work, will be conducted at this stage to evaluate the project's viability and evaluate key risks and areas for further work. This is an interim step to justify a more expensive full **feasibility** study. If the results of the advanced exploration work are very good, a company may move straight to a feasibility study and not undertake a pre-feasibility study. Similarly, in some instances, a company may undertake a desktop study prior to a pre-feasibility study to confirm whether the results justify the pre-feasibility study.

Closure and Rehabilitation

Based on the results of advanced exploration activities, if further investment in more precise estimation and engineering studies is not warranted, the company may not want to advance the project to the next stage. In this case, as in the early and intermediate exploration stages, the site will be closed and rehabilitated (see Closure and Rehabilitation of Exploration Site on the previous page).

1.3 Who Are the Main Players in Mineral Exploration?

Junior exploration companies carry out most of the exploration activities. Federal, provincial, and territorial governments support mineral exploration by developing and providing geological maps and reports that guide prospectors and exploration companies to areas with mineral potential. Also, some jurisdictions enable prospectors, through special programs of training and limited financial support, to promote early, grassroots mineral exploration. Governments also have a regulatory role in administering mineral rights and claims, and providing work permits for exploration activities. A program for tax incentives is also sometimes offered by governments to attract exploration activities to a jurisdiction.

MINERAL EXPLORATION: WHO ARE THE MAIN PLAYERS?

	Potential Roles and Responsibilities
Communities	• Engage in discussions with company regarding employment, business opportunities, and environmental baseline work such as fisheries, vegetation, and wildlife studies for advanced exploration projects • Provide input through a permitting board or agency that will want to obtain local views and concerns on the consequences of issuing a permit (existence of a board/agency depends on the scope and stage of the exploration project) • Elders or local authorities may be able to recommend good sites to establish a camp and point out locations to avoid, such as ceremonial sites, traplines, and hunting grounds • Conduct a skills and education inventory of their members and establish a training program • Develop exploration businesses or other businesses related to other potential future activities
Governments (provincial, territorial, federal)	• Develop and provide geological, geochemical, and geophysical maps and reports to guide prospecting and exploration • Administer mineral claims and issue work permits for exploration • May perform site visits to ensure rules and regulations are being followed • Provide tax incentives and programs to attract mineral exploration investment
Prospectors	• Search for mineral showings or occurrences • Use government maps and reports to guide field work

Junior exploration companies	• Focus on finding mineral and metal deposits and selling/partnering with a senior mining company • Funds for their projects are raised on the market • These companies are small and usually publicly owned; they are not large enough to operate a mine and do not have a revenue stream
Senior (major) mining companies	• Search for new mineral or metal deposits to expand existing mines or develop new mines • These companies are large, usually publicly owned, and have the expertise and funds to develop, construct, and operate a mine, usually with a large and diverse range of mineral or metal assets
Contractors/ service providers	• Provide goods and services, e.g.: ◦ Drilling companies ◦ Expediters – provide key supplies and services (usually from nearest community), e.g., set up and supply camps, arrange aircraft, claim staking, line cutting ◦ Helicopter services ◦ Geophysical survey companies ◦ Remote sensing or air photo interpretation (some companies may do this in-house) ◦ Glacial sediment and glacial dispersion surveys ◦ Geological services ◦ Caterers ◦ Local businesses – accommodations, storage for core or equipment, supply of fuel, propane, groceries, earth moving (e.g., back hoe, front-end loader, small bulldozer), transport (tandem truck, transport truck, skidder, all-terrain vehicle, snowmobile), line cutting, stripping vegetation and soil cover, and clearing drill sites ◦ Laboratory services ◦ Environmental services companies – baseline environmental studies, and requirements for testing as part of land-use licences, etc.
Industry associations (provincial, territorial, national)	• Address common issues and provide a unified voice to the public and government • Represent exploration companies • Develop information, provide training for the sector and others on items such as corporate social responsibility, outreach, information dissemination • Work with governments on land use, taxation, and other mineral development policy and issues

1.4 Acts and Regulations

Facts and Figures

Aboriginal-owned land is becoming increasingly significant. For example, in Nunavut the Inuit own large tracts of land called Inuit-owned lands. For these lands, the Inuit enjoy ***surface rights*** *and, in selected cases, sub-surface rights. Nunavut Tunngavik Incorporated (NTI) oversees the use of Inuit-owned lands in Nunavut. Where land claims are in negotiation, the federal government makes interim land arrangements to protect Aboriginal interests during the negotiations.*

Source: www.tunngavik.com.

This sub-section identifies the general legal and regulatory requirements, jurisdictions, and licences and permits that apply during mineral exploration.

What Are the Jurisdictions?

The rules governing land acquisition vary greatly by province and territory. Individuals must check with the specific jurisdiction and follow its regulations. The responsibility for managing mineral resources and exploration and mining activities has been granted to the provinces and the Yukon. In Nunavut, the Northwest Territories, and on Indian Reserves, this responsibility rests with the federal government through Aboriginal Affairs and Northern Development Canada (AANDC).

There are two types of land available for exploration: Crown land and some privately owned surface lands where the sub-surface mineral rights are owned by the Crown. The federal government, through AANDC, is responsible for federal Crown lands in Nunavut, the Northwest Territories, and on Indian Reserves, and has legislation

covering its use. The provinces and the Yukon are responsible for Crown lands within their province or territory and have legislation covering its use and disposition. Governments control the surface and sub-surface rights for provincial, territorial, and federal Crown land.

What Licences and Permits Are Required?

The requirement for licences and permits during exploration vary between provinces and territories depending on the type of exploration work being done. The following table shows examples of permits that may be required for different activities throughout the different stages of exploration.

LICENCES AND PERMITS	
Activity	**Possible Permits Required**
Basic prospecting	• Prospector's licence
Airborne surveys	• No permits required
Claim staking or on-line acquisition	• Register claims according to requirements of the area
Ground exploration/drilling	• Various permits issued under applicable mining legislation (depending on the amount of work and size of project)
Tree cutting	• Permit to cut trees
Camp and drilling program	• Various permits normally required for larger projects that have a camp
Road construction for access, fuel storage, or exploration trenching	• Various permits may be required

1.5 Environmental and Social Impacts

This sub-section identifies the possible environmental and social impacts a community may experience during mineral exploration. Suggestions for **monitoring** and reducing impacts (mitigation), and community participation are included.

What Are the Potential Environmental Impacts?

Environmental impacts during mineral exploration are usually low, especially during early exploration. The Canadian mineral industry is a world leader in environmentally safe and clean exploration practices. Companies understand that it is important to respect the rights of others, to operate safely, and to take care not to harm the wildlife, land, and water.

In addition to voluntary good practices, companies follow provincial, territorial, and federal laws and respect the communities near where they operate. With such measures, negative impacts are reduced, but they are still possible. Some of the main impacts and how they are minimized are shown in the following table. It is important to note that the impacts vary depending on the stage of exploration.

ENVIRONMENTAL IMPACTS		
Type	**Activities and Potential Impacts**	**Mitigation**
Land use	• Camp construction • Line cutting • Drilling programs (intermediate and advanced exploration) • Fuel storage • Road construction for advanced exploration	• Comply with Government regulations for camps, roads • Minimize area • Re-vegetate (depending on the area and circumstances) • Establish drill waste disposal plan • Follow fuel storage standards • Develop spill recovery plans
Water quality	• Waste from drilling programs (mud) • Drill holes	• Carefully plan drill program to prevent water contamination
Wildlife	• Animals attracted to garbage and food waste • Migratory patterns affected by presence of humans • Migratory patterns affected by noise from helicopters, planes, and drill rigs	• Dispose of garbage and waste in compliance with local regulations • Teach wildlife awareness to crews in camp • Keep aircraft away from migrating animals • Time program to avoid critical periods for wildlife (i.e., caribou calving)

What Environmental Monitoring Is Conducted?

Environmental monitoring is a way to evaluate the environmental impacts of exploration activities after mitigation measures have occurred. It should be done during all phases of mineral development. During exploration, because activity is relatively small with low impacts, the company will do most of the environmental monitoring. This may involve checking:

- The fuel storage area;
- That waste is properly disposed of;
- That food is not left where animals can get it;
- That no waste remains after drilling rigs leave; and
- The water quality of local water bodies (streams, creeks, lakes, rivers, ponds, etc.).

A company is encouraged to discuss monitoring with local Aboriginal communities and to seek their input and support for monitoring activities and, where possible, include a community member on the monitoring team. The back-filling of trenches is a sound practice. The monitoring of fuel storage areas should be expanded to include areas where refueling takes place if separate from the storage area.

Companies must also follow the conditions of any government-issued permits or licences granted for exploration. Government inspectors

will likely visit the site to ensure required conditions are being met and regulations are being followed. For larger exploration projects, spill plans (i.e., for fuel) and waste disposal plans may be required.

What Are the Potential Social Impacts?

Social impacts at the exploration phase are likely to be minimal and tend to be positive. The table below lists some possible impacts to help communities understand and anticipate any potential effects of exploration. One common possible impact of exploration projects may be a community's unrealistic expectations about the development of a mine. Most exploration projects will not advance to mine development.

SOCIAL IMPACTS

Type	Activities and Potential Impacts		Solution
Social	Working away from home for extended periods	• Less time to spend on traditional activities • Workers and their families may be separated for several days or weeks • Marital stress • Opportunity to meet new people	• Plan activities around work schedule • Encourage the creation of support groups or programs to minimize the stress experienced by families
Economic	Increased employment levels	• Training and skills development opportunities • Widens gap between employed and unemployed	• Emphasize the positive working role models within the community
	Increased income levels	• Out-migration of community members with well-paying jobs • More money flowing into the community may result in an increase in social problems	• Establish or encourage the development of community addiction response programs and support groups
	Local purchases	• Increased exploration activities may lead to more purchases from local businesses and suppliers, benefiting the local economy • Increased buying power	• Identify and communicate the type, quality, and quantities of goods and services required so there are no misunderstandings and encourage the local purchasing of these goods • Encourage small business development, training, and support
Cultural	Arrival of new people in the community	• New workers may arrive with different culture • New ideas and technologies can create new opportunities, but also challenge traditional ways of life	• Offer cultural awareness training, delivered by members of the community, to ensure new people in the community are informed of its values and traditions
	Hunting and fishing	• Potential for the disruption of hunting and fishing times due to mineral activity	• Company minimizes airborne and on-ground activity that could potentially have an impact on bird or animal migration

It is important to note that activities and any resulting impacts may differ depending on the stage of the exploration project, and they tend to increase if a project advances along the mineral development cycle.

1.6 How Can Aboriginal Communities Get Involved in Mineral Exploration?

The mineral exploration phase can represent an important part of community development and help build greater awareness and understanding of some of the opportunities during this phase. It can also open further opportunities if a project advances into the later phases of the mineral development cycle. While early exploration work could be limited in scope and longevity, it does present the opportunity to build local capacity, allow individuals to gain short-term meaningful employment, and assist in the development of building knowledge related to the mineral industry. It is important to remember that mineral exploration companies have no revenue during exploration.

Whatever the scope of the project, it is important that communities and companies have an ongoing dialogue. The major community input during exploration is usually through communication with the company carrying out the project. Governments encourage prospectors and exploration companies to engage with the

Facts and Figures

What Is the Duty to Consult?

The duty to consult is an obligation of the government as a whole. The Crown has a legal duty to consult and, where appropriate, accommodate when its proposed conduct might adversely affect established or potential Aboriginal or Treaty Rights, particularly in the approval of developments involving land and resources. Crown conduct includes, for example, the work of government that allows projects to move forward (such as the issuance of authorizations). Although it is a Crown duty, third parties also have a role to play in the process. For example, engagement done by a company may be taken into account when the Crown is assessing consultation obligations. It is also essential that Aboriginal groups actively participate in, and contribute to, the consultation process by explaining how their rights might be adversely affected, and communicating their concerns and providing information in a timely manner. For more information, visit ***www.aadnc-aandc.gc.ca/eng/1100100014649****.*

community and its members directly, beginning with the Chief and Council. Other groups such as Tribal Councils, Inuit governments, and regional or province-wide Aboriginal organizations can also be included in the sharing of information related to specific projects. Early discussion with Aboriginal community members is in everyone's interest. It allows the community and the company to learn about each other's resources and priorities. The company can explain what the project involves, where it is located, and who will be doing the work. By listening and sharing information, the parties can identify potential problems or conflict areas, and work together to resolve them and promote mutual benefits.

For more information on the recommended industry approach to engagement, check out *Early Aboriginal Engagement: A Guide for Proponents of Major Resource Projects* (www.mpmo-bggp.gc.ca/desc/aboriginal-autochtones-eng.php).

It is important that community members ask questions, raise concerns, and learn about the exploration process and its various stages. Questions that may arise include:

- What is the expected impact on the land, what is the activity, and are there any maps?
- What benefits will there be for local communities? Will the benefits be permanent or temporary?
- What are the potential positive and negative impacts and how do we maximize/minimize them?
- What are the employment/business opportunities?
- How can communities participate in the environmental and social impact assessment process?
- How will the project developer respond to community concerns?

Having answers to these questions will help prepare the community should an exploration project move to the next phase (development and construction) and lead to a larger investment. Communities may also find it useful to have oral presentations from exploration companies, interpreted into a language other than English or French if appropriate, so that all community members can fully understand what is happening.

Facts and Figures

Early engagement can serve as a turning point for communities. Kasabonika Lake First Nation increased its participation through newsletters, meetings, radio, and surveys. The community also negotiated a step-by-step approach to the mineral exploration process.

1.7 Community Employment and Other Economic Opportunities

Facts and Figures

The close proximity of Aboriginal communities to exploration and mining projects presents a window of opportunity for both Aboriginal peoples and industry. Aboriginal communities are increasingly being recognized as key contributors to the minerals and metals sector as employees or for the supply of goods and services.

This sub-section identifies some of the employment and other economic opportunities that may be available to Aboriginal communities during exploration.

What Are the Employment Opportunities?

Job opportunities during the exploration phase of the mineral development cycle may be limited and short term, lasting only a few weeks to a few months. However, these opportunities allow community members to gain useful experience and skills that may be transferable to other projects or other economic sectors. The length of the job depends on the stage of the project and whether the exploration project is successful.

Early discussions with the company will allow the community to find out which jobs may be available. The community may want to help the company by organizing a venue for interviews and advertising available positions. The community may also decide to conduct a skills and education inventory of its members.

Junior exploration companies usually hire only a few full-time employees, and they are generally specialists (geologists, geophysicists, drill operators, and pilots), to carry out the exploration work. To become a specialist in these areas requires a university or college degree. However, projects may also need less specialized personnel, including field assistants, camp staff, line cutters, prospectors, and samplers.

Exploration projects may include environmental baseline work. This work may provide opportunities for local people to assist in fisheries and wildlife studies. Companies will train any local workers to ensure they are safe and equipped to do the job.

The following table gives examples of employment opportunities that may be available depending on the various stages of exploration.

EXAMPLES OF EMPLOYMENT OPPORTUNITIES

Position	Entry Requirements	Remarks
Field assistant	• Reasonably fit, able to read and write	• Prepared to work outdoors, may have to walk considerable distances with a backpack full of samples or rocks
Drill helper	• Reasonably fit, able to read and write, often hire those with experience	• Able to handle boxes of core and drill rods, which may be heavy, usually shift work
Line cutter	• Reasonably fit, able to use a compass, able to read and write	• Able to use an axe, machete, chain saw, compass
Kitchen helper	• Able to work in a kitchen with food	
Cook	• Able to cook, plan meals, and run a kitchen	
Camp expediter	• Able to organize incoming and outgoing movement of freight, fuel, samples, etc., able to read and write	
Geophysical assistant	• Reasonably fit, good with figures, knowledge of computers	• Prepared to work outside, often have to walk considerable distances in a day
Truck driver	• Licensed to drive trucks	
Earth-moving operator	• Licensed to operate the machines required – one or more of front-end loader, bulldozer, backhoe, skidder	• Usually requires heavy equipment operator's licence
Mechanic	• Gasoline or diesel engine experience	• Does not have to be qualified as long as knowledgeable, experienced, and skilled
Welder	• Able to weld effectively	
Carpenter	• Able to work with wood	
Environmental monitor	• Able to read and write, reasonably fit	
Accommodation janitor	• Able to look after buildings/ tents in camp	
Accommodation housekeeper	• Able to clean rooms in camp, bunkhouse, tents	

For more details on the types of jobs available at the exploration phase, consult the *Mining Industry Human Resources Guide for Aboriginal Communities* (www.aboriginalmining.ca/en/exploration/careers.asp).

Exploration activities may also offer training opportunities to Aboriginal communities. In some instances, communities have developed their own training programs to teach people how to prospect. Because of their knowledge of the land around them, local community members are in an excellent position to become prospectors.

Facts and Figures

Opportunities exist for Aboriginal peoples to be involved in mineral exploration. Contractors are needed throughout the various stages of exploration, including prospectors, line cutters, caterers, equipment suppliers, and construction and maintenance workers for camps.

What Are the Other Economic Opportunities?

Economic opportunities exist for communities, even at the exploration phase. Companies commonly employ an expediting company to organize activities like camp set-up, transportation, and catering. If such a business is available in a community nearby, then it will be in a good position to provide goods and services to the company.

It is important to remember that exploration projects are usually on tight time schedules, have limited budgets, and generally are not producing a revenue stream. As well, securities exchange rules make it difficult for companies to pay expenses that are not directly related to exploration. There is usually not enough time for communities to develop businesses to assist the exploration company. The community may wish to keep informed of the company's exploration plan for the next season so that it can prepare to take advantage of future potential economic opportunities.

Each community is unique and will be equipped differently to capture possible economic opportunities. Types of business opportunities generated by exploration include a number of contracting/service provider-oriented businesses:

- Digging and trenching with heavy equipment;
- Site reclamation, tree cutting, and planting;
- Line cutting;
- Construction of camps/camp staff;
- Food, accommodation, and catering;
- Expediting, helicopter/air support rental;

- Equipment/vehicle rental and fuel;
- Drilling contracting;
- Transportation and freight services; and
- Environmental baseline studies.

Some communities have formed their own prospecting and drilling companies. There is potential for economic benefits through these activities. If prospecting is successful and encouraging samples are found, the prospector may be able to interest exploration companies in forming a **joint venture** or **option** a property to ensure that further work is carried out.

Communities and exploration companies are encouraged to work closely together, as early as possible, to forge alliances and partnerships in training, employment, and business development. As the exploration project advances, they may initiate negotiations that can result in agreements (e.g., Letter of Intent, **Memorandum of Understanding**). Although formal or legal agreements are not required, this is an excellent opportunity to build a relationship (see sub-section 2.7 for a description of the different types of agreements).

1.8 Community Experiences: Athabasca Basin Development Limited Partnership

The Athabasca Basin Development Limited Partnership (ABDLP) of Wollaston Lake, Saskatchewan, is an Athabasca and Aboriginal-owned investment company with its primary holdings in the mining and exploration services sector, particularly in uranium and potash mining. The limited partnership is owned by the seven far north communities in Saskatchewan: Fond du Lac, Black Lake, and Hatchett Lake Denesuline, who own approximately 70% of the partnership through a share-ownership structure that is similar to that of a public company; and Campsell Portage, Uranium City, Stony Rapids, and Wollaston Lake, where the company headquarters are located.

The company looks for investments that are sustainable, well-managed, and of general value for its **shareholders**. Investments are focused on the mining and exploration sector and include partial or complete ownership in construction (Points Athabasca), underground mining (Mudjatik Thyssen Mining), security (Athabasca Basin

The ABDLP was the first to receive the Prospectors and Developers Association of Canada's (PDAC) Skookum Jim Award in 2008.

Security), diamond drilling (Team Drilling), logistics (Points North), electrical (Flyer Electric), road maintenance (Lonona Contracting), and air transportation (West Wind Aviation). Since its formation in 2002, the ABDLP and its group of companies have grown to employ over 1000 people – mostly Aboriginal – and their recent consolidated revenues have exceeded $75 million.

Corporate Social Responsibility

The ABDLP is committed to being a responsible and contributing corporate citizen. The company developed a strategy for community investment that is designed to increase the opportunities for the Athabasca region of Saskatchewan by enhancing the lives of its residents. The ABDLP is actively involved in the communities in which it operates through direct donations, being actively involved in and present at community events, and through direct employment and training of community members.

The company attributes its success to partnering with other dynamic and thriving companies that have a proven track record in providing award-winning customer service.

Awards

The ABDLP was the first to receive the Prospectors and Developers Association of Canada's (PDAC) Skookum Jim Award in 2008. This award recognizes exceptional achievement and/or service by an Aboriginal-run service business for the Canadian mining industry, a Canadian Aboriginal exploration or mining company, or individuals that have made a significant contribution to the mining industry.

2 MINE DEVELOPMENT AND CONSTRUCTION

2.1 What Is Mine Development?

2.2 What Are the Mine Development Activities?

2.3 Who Are the Main Players in Mine Development?

2.4 Acts and Regulations

2.5 Environmental and Social Impacts

2.6 How Can Aboriginal Communities Get Involved in Mine Development?

2.7 Community Employment and Other Economic Opportunities

2.8 Community Experiences: Nuna Group of Companies

2 MINE DEVELOPMENT AND CONSTRUCTION

If exploration leads to positive results, the project moves to the mine development phase.

This section explains the purpose of development, identifies the main activities and players, and outlines opportunities for Aboriginal communities to get involved during this phase of the mineral development cycle.

2.1 What Is Mine Development?

If exploration leads to positive results, the project moves to the mine development phase. The purposes of this important phase are to evaluate the potential value of the mineral deposit that has been identified at the exploration phase, to determine if it can be mined profitably, and if so, to build the mine.

In order to build a mine, the mineral deposit must be large and valuable enough to pay for the construction costs (**capital costs**) and for the costs to operate the mine (operating costs).

Factors that determine if a resource is economical include:

- Location of the resource;
- Accessibility of the resource;
- Size of the resource;
- Value of the resource;
- Type of mineral;
- Access to **infrastructure** (roads, airstrips);
- Market prices of the minerals and metals;
- Distance from markets and supply points;
- Ability to recover the resource in an environmentally safe and socially responsible way;
- Regulatory regime (e.g., taxes and royalty rates); and
- Availability of qualified work force.

The evaluation will involve a series of detailed geological, technical, and economic studies and analysis of data to increase the company's knowledge of the resources (i.e., the shape and size of the mineral deposit and the quantity of metals or minerals). The company uses this information to make important decisions – decisions that may determine whether it will construct

a mine. It is at this stage that the company will prepare the design of the mine and facilities. Once the evaluation and planning are completed, a decision on building a mine has been taken, and the required permits and licences have been obtained, construction can begin.

Time Frames

Mine development can take anywhere from 7 to 10 years. The time needed depends on where the mine is located, how large and complex the development is, and the regional regulations and review processes. In general, it takes:

- Two to three years for test work and studies (environmental studies and feasibility studies);
- One to three years for environmental assessment and permitting; and
- Two to four years to build the mine and supporting infrastructure.

Costs

The cost of developing a mine depends on:

- The type of mine;
- Mine size (the larger the mine, the higher the cost), surface/open pit versus underground;
- The location (more remote equals more expensive); and
- The amount of work and time required to do the test work, collect the data, and complete environmental studies and permitting.

Test work, studies, and permitting can cost in the $10 million range. This cost can climb as high as $100 million if special facilities are needed on-site for additional testing and data collection, as is the case for diamond mines. Construction costs are often in the $100 million range or more.

Facts and Figures

The cost of building a mine is very high, particularly when the mine is large, remote, and has technological challenges. Ekati and Diavik, two diamond mines built in the Northwest Territories, had construction and start-up costs of $750 million and $1.3 billion, respectively.

Sources: www.bhpbilliton.com/home/businesses/diamonds/Pages/default.aspx and www.diavik.ca.

2.2 What Are the Mine Development Activities?

During this phase of the mineral development cycle, the company will significantly increase its activities and investment to define the characteristics

of a mineral deposit and determine if it is economically worthwhile (viable to develop). Depending on the location and type of mineral, development activities will include many of those performed during the advanced exploration activities, but in a more extensive way. This means more samples, more drill holes, and more field tests to define the characteristics of a mineral deposit.

Environmental Assessment

An environmental assessment (EA) is mandated by government and is used to examine the potential impacts that a project may have on the environment during its lifetime. Companies are required to submit an environmental assessment as part of the process of obtaining a mining licence. For more information about environmental assessment, see sub-section 2.5 on Environmental and Social Impacts.

Feasibility Studies

Feasibility studies are a series of planning studies and evaluation reports of the geological, engineering, economic, legal, and site data undertaken by the company. The purpose of feasibility studies is to evaluate the financial viability, technical and financial risks, and robustness of the project. Feasibility studies usually include the following:

FEASIBILITY STUDIES	
Geology and resource determination	• How large is the deposit or resource? • What is the grade of the minerals or metals in the deposit?
Mine planning	• What will be mined? • How will it be mined (open pit/surface or underground)? • What equipment will be used to mine it?
Process plant test work and plant design	• What is the best way to extract the minerals or metals (for example) from the host rock? • Will there be a **smelter**? • What mineral wastes will be generated?
Infrastructure planning	• What roads, airstrips, camps, and complexes will be needed?
Water and waste management planning	• What are the water supply needs? • What are the discharge quality requirements? • How can waste be safely disposed of?
Environmental and socio-economic planning	• What are the main issues from the environmental and socio-economic studies? • How can plans address these issues?

Community agreement(s)	• What agreements are required and with whom?
Mine closure and reclamation	• What are the best approaches for reclamation and closure? • What labour transition plans are required?
Operating cost estimates	• How many workers are required? • What types and amounts of equipment and supplies are required during operations? • What are the annual operating costs?
Capital costs	• What are the costs to plan, permit, and construct the facilities?
Financial analysis	• What are the costs to borrow money to build and operate the mine? • What is the yearly cost and annual earnings? • What is the expected profit or loss?

Mine Closure and Reclamation Plan

An important step in the planning that occurs at the development/construction phase is the future mine closure and reclamation plan. This plan is a detailed report on how the mine site will be cleaned up and restored once mining operations are completed. The direct closure impact on all areas of a mine site must be addressed as an integral part of the design criteria during the detailed engineering of the project. This includes removal of the structure, how to handle **tailings**, how to dispose of chemicals and hydrocarbons, **waste rock** slope stability, pit shut-down, and re-vegetation of the terrain.

The provinces and territories have adopted requirements with respect to mine reclamation and closure, as well as the requirement to provide financial assurance (e.g., a bond) to cover the closure costs. This financial assurance can be required before the start of construction. If mine closure and reclamation are too expensive, the proposed mine may not move on to production. The method of calculating and the acceptable forms of financial assurance vary depending on the jurisdiction.

Permitting

As the mine development activities increase and become more intense, permits will be required. The mining company will submit a project description to governments or local boards if feasibility studies are encouraging and show that there is a potential mine project beyond

Facts and Figures

*Most important in the planning process are safety and consideration of workers and the local environment. A closure and reclamation plan explains how the company will **rehabilitate** the mine site once the **ore** runs out and the mine is closed.*

exploration. This will start the environmental assessment process, which must be completed before moving to final/**bankable feasibility** and the start of construction.

Community Engagement and Consultations

A wide range of community consultations often take place during the mine development process, including:

- Public meetings and hearings;
- Open houses;
- Workshops;
- Focus groups;
- Interviews; and
- Meetings and consultations related to environmental assessment and licence and permit applications.

Communities provide input and feedback on a proposed project during the consultations, raising issues and concerns and identifying potential impacts. Consultations allow communities to participate in a meaningful way and to experience a sense of ownership of the project.

Negotiation of Agreements

The types of agreements negotiated between a mining company and the community at this stage vary and may include **Impact and Benefit Agreements (IBAs)** or their equivalent. Even if formal agreements are not legally required, this is still an opportunity for the mining company and Aboriginal communities to develop a good relationship. These types of agreements will be discussed in more detail later in this section under Community Employment and Other Economic Opportunities.

Project Financing

Once a final cost is known, the mining company needs to secure project financing. The final or bankable feasibility is used to demonstrate a project's viability and to help secure investment. Companies may need to borrow the money from a bank or raise money by issuing shares on the stock

market. Large companies may be self-funding due to revenue generated from other mining operations.

Investment Decision by the Mining Company

The final investment decision – whether to build the mine – happens when the final feasibility study is finished, project financing is arranged, and permits are received. The Board of Directors of the mining company will make the final decision on whether to move ahead with construction of the mine.

Although it is hard to imagine, given how much work, money, and time have been invested to get to this point, the decision could be to cancel or postpone the project because of uncertainty in the **commodity** markets. This means that all agreements negotiated by the company with Aboriginal communities, service providers, etc., to this point are conditional agreements that depend on whether the company decides to move forward with constructing the mine.

Construction

Mine construction can only begin after government agencies issue all required permits and the company has raised sufficient capital to build it. This stage can take several years depending on the project's complexity. Construction refers to the development of the entire facility, including the mine, processing plant (mill), and all related infrastructure. Infrastructure development includes all facilities needed to support the operation other than the mine and processing plant (mill). This stage requires most of the money and provides most of the jobs.

Common activities during construction include:

- Site preparation;
- Clearing and initial preparation for mining (i.e., overburden removal, construction of areas to hold process plant/mill wastes);
- Construction of accommodations;
- Construction of process and site facilities (i.e., mills, offices, etc.);
- Building roads and airstrips (installation of power lines and railway);
- Establishment of training programs for personnel; and
- Installation of environmental protection equipment.

2.3 Who Are the Main Players in Mine Development?

The table below summarizes the major players and their potential roles and responsibilities during mine development.

2.4 Acts and Regulations

This sub-section identifies the general regulatory requirements, licences, permits, and leases that may apply during mine development.

Mine development regulations are complex and vary among provinces, territories, and Indian Reserves. The purpose of all regulations is to develop the mine in a way that will benefit

MINE DEVELOPMENT: WHO ARE THE MAIN PLAYERS?

	Potential Roles and Responsibilities
Communities	• May carry out sampling and analysis procedures for environmental monitoring • Enter into negotiated partnership or IBA with companies • Generate business development and employment opportunities, e.g., joint ventures • Provide labourers for construction
Governments (provincial, territorial, federal)	• Set the rules for permitting, manage the permitting process, and issue required permits • Conduct environmental assessment process
Junior exploration companies	• Typically sell interests to senior company, but in rare instances will develop a mine
Senior mining companies	• Manage and operate mining projects • Main players at that stage
Contractors/service providers	• Consulting engineering firms – perform feasibility studies, detail design, construction management, and project management activities • Equipment suppliers – manufacture and sell equipment • Construction companies – build roads, dams, plants and shops, buildings, offices, pipelines, and other facilities
Industry associations (provincial, territorial, national)	• Represent mine developer's interests • Influence government mining policy • Provide a forum for shared research and best practices

people and minimize the potential negative impacts on the environment.

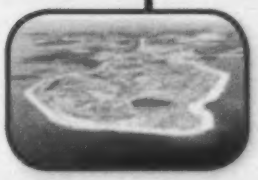
What Licences and Permits Are Required?

Permits and licence requirements, and their application processes, vary in different regulatory jurisdictions in Canada. Provincial and territorial regulatory authorities generally administer permits. The federal government, through AANDC, administers permits and licences in Nunavut, the Northwest Territories, and on Indian Reserves. Several federal departments have permits, licences, or authorizations that apply to mining projects.

Key permits include those related to land and water use, mine closure and reclamation plans, and camp construction permits. The following table outlines the general licences, permits, and authorizations required during mine development.

KEY DEVELOPMENT PERMITS, LICENCES, AND AUTHORIZATIONS

Water	• Provincial and territorial agencies (usually guided by the Council of Ministers of the Environment [CCME] guidelines) generally control water discharge criteria and water licences • Water crossing permits are issued under the *Navigable Waters Protection Act*
Fish	• Authorization under Section 35 of the *Fisheries Act* is required if serious harm to fish habitat is expected • Authorization under Section 36 of the *Fisheries Act* is required if deleterious substances will be deposited into a body of water • Fisheries and Oceans Canada (DFO) has developed various guidelines to assist project proponents
Wildlife	• In the case of potential effects on migratory wildlife, the *Migratory Birds Convention Act* applies, and in the case of endangered and threatened species, the *Canadian Species at Risk Act* applies • The provinces and territories also have a range of policies and legislation addressing wildlife and species at risk issues
Mine construction and development	• Construction permits for buildings • Explosive licences or permits • Authorization from provincial/territorial departments to allow excavation to go ahead • Permits for land use for the mine and infrastructure • Permits for any airstrip, access road, or electricity transmission line • Permits for any explosive manufacturing facility



What Is a Mining Lease?

A **mining lease** authorizes mining companies to access and develop a parcel of land into a mine. It sets the boundaries on where certain infrastructure can be built or deposited (i.e., tailings or waste rock piles) and sets requirements on how to operate environmentally. Each lease requires a mine closure and reclamation plan, a yearly lease fee, and security deposits.

Leases are issued by provinces and territories, with the exception of Nunavut, the Northwest Territories, and on Indian Reserves, where leases are issued federally by AANDC. There is separate mining rights legislation for each of the 10 Canadian provinces and the Yukon, with the Canada Mining Regulations applying in the Northwest Territories and Nunavut. Indian Mining Regulations apply on Indian Reserves.

The life of the mining lease varies by province or territory. They are valid in most provinces/territories for 20-30 years and can be renewed. Some jurisdictions impose certain conditions upon the renewal of mining leases (e.g., the property must be the site of an active or closed mine, the lease area must be surveyed, etc.).

2.5 Environmental and Social Impacts

This sub-section identifies the potential environmental and social impacts a community may experience during mine development. It also explains the purpose of an environmental assessment, which must be completed for all mining projects in Canada. This sub-section also includes the types of environmental monitoring, mitigation measures, and opportunities for community input.

What Are the Potential Environmental Impacts?

Every mine development is unique and will have an impact on the environment in different ways. Using modern technologies, sound planning, and rigorous monitoring, specialists can reduce these impacts. The following table outlines the types of environmental impacts possible during mine development.

What Environmental Studies Are Required?

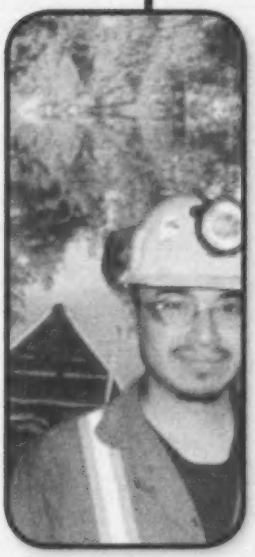
Environmental baseline studies are generally required to complete an environmental assessment. They start as early as the exploration phase. These studies include developing a detailed description of the environment. In addition, the socio-economic

ENVIRONMENTAL IMPACTS

Type	Activities and Potential Impacts	Mitigation
Land use	• Construction of access roads and power lines, uncontrolled access to mine site • Construction of buildings, workshops, processing plant, and permanent camp • Bulk sampling and extensive drilling programs • Fuel and chemical storage	• Plan to minimize land disturbance due to roads • Install security gates • Use community feedback in design and layout of buildings • Minimize land use • Follow fuel storage standards • Develop spill plans • Establish fuel management programs
Air quality	• Dust from roads and site development activities	• Water roads to minimize dust emissions
Water quality	• Impacts on surface and sub-surface water quality	• Control drainage • Ensure discharge criteria are met • Conduct water quality monitoring • Identify alternative water sources
Wildlife	• Animals attracted to garbage and food waste • Migratory patterns affected by the presence of humans, noise from aircraft, and blasting • Impacts on fish and fisheries	• Develop waste management programs • Use environmental baseline work to understand wildlife activity in the area • Educate employees and contractors to understand their responsibilities towards wildlife • Protect fish spawning and rearing areas, and fish farming • Establish no hunting/fishing zones
Cultural material	• Disturbance of archaeological and heritage sites	• Identify and protect archaeological and heritage sites

assessment evaluates the social and economic **sustainability** during development, operations, and beyond closure of the mine. Examples of surveys include:

- Archaeology;
- Land use;
- Water quality;
- Surface and ground water hydrology;
- Vegetation;
- Wildlife;
- Administrators;
- Traditional knowledge;
- Terrain;
- Socio-economic;



- Air quality;
- Aquatic resources (fisheries);
- Hydrogeology;
- Noise;
- Soils;
- Acid rock drainage/metal leaching; and
- Fish habitats.

What Is an Environmental Assessment?

An environmental assessment (EA) is a process to identify and assess the potential environmental effects of a project before it is built. The purpose of the EA is to avoid or minimize adverse environmental effects before they occur and to incorporate social and environmental factors into decision-making.

Both federal and provincial laws require some form of EA process to be conducted due to the nature of regulatory authorizations required by mining projects.

In the North, most mining projects are assessed by impact review boards established by federal statutes. Land claims agreements have created new models for the way an EA is conducted in the North. These processes share the following common elements:

- They apply to federal, territorial, and where relevant, Aboriginal governments;
- Advisory boards conduct EAs and make recommendations to government;
- Board nominees are identified by government (both federal and territorial) and Aboriginal organizations;
- Aboriginal groups have explicit roles in these processes; and
- Assessments are independent from decision-makers.

The *Canadian Environmental Assessment Act* (CEA Act) explains the full process that must be followed for federal EAs. It explains when an EA is necessary and the responsibilities of the federal departments. Some of the departments of the Government of Canada have to give approvals for certain components of a project. These departments, called Responsible Authorities, are in charge of ensuring that an EA is completed. They cannot give approvals for any part of the project until the EA is finished.

Typically, the federal EA process includes:

- Determining if an EA is required – it does not consider the likely effects of the project, but simply whether or not the legislation or act applies;

- Identifying who could be involved;
- Planning the EA;
- Conducting analysis and preparing an EA report;
- Reviewing the EA report by federal departments;
- Making of EA decisions by Responsible Authorities; and
- Implementing mitigation program and monitoring (if required).

EAs may make full use of the traditional knowledge of Aboriginal peoples. The mining company is responsible for collecting traditional knowledge or making possible its inclusion. Traditional knowledge can be used to determine the environmental effects and evaluate how serious they may be. Traditional knowledge will also be used to select ways to reduce the environmental effects.

Laws at the federal, provincial, and territorial (Yukon) levels specify when EAs or impact reviews are required and how to do them. The Government of Canada will do an EA when certain federal authorizations are required. The provinces and territories will do EAs when permits are needed under their laws.

What Environmental Monitoring Is Required?

Environmental monitoring is in place to provide early warning of potential negative impacts so that corrective actions can be quickly put in place. The company usually performs the monitoring, analyzes the results, and reports them to government agencies or sometimes to community monitoring agencies.

Environmental monitoring during mine development includes monitoring water flows and quality, air quality, and fish habitat, and can also include vegetation changes. Air quality is monitored for its potential impact on wildlife and humans. Scientists analyze these tests. Local people are often trained to carry out sampling and analysis procedures. As an example, direct changes in plant communities are watched for, as well as the presence or absence of non-native species.

What Are the Potential Social Impacts?

While mine development offers communities employment and business opportunities, it may also result in some positive and/or negative social impacts. The following table illustrates some of these possible impacts.

SOCIAL IMPACTS

Type	Activities and Potential Impacts		Solution
Social	Shift/rotational work	• Less time to spend on traditional activities • Workers and their families may be separated for several days or weeks • Opportunity to meet new people	• Plan activities around work schedule • Encourage the creation of support groups or programs to minimize the stress felt by families
	Social investment	• Voluntary social investment by companies may increase local benefits; it is important for these to be collective benefits that do not foster dependency or favour certain groups	• Ensure that social investment is done with the full and transparent participation of those involved • Conduct assessment of priorities, anticipated results, and sustainability • Work with the changing dynamics of the community
Economic	Community partnerships and alliances developed	• Increased business opportunities • Adds wealth to a community	• Improve and enhance community infrastructure where possible
	Increased employment	• Increased training and skills development opportunities	• Emphasize the use of positive working role models within the community
	Increased income levels	• Creates positive role models • Widens gap between employed and unemployed • More money flowing into the community may result in an increase in social problems	• Provide workshops on money management, saving of wages, banking, etc. • Establish or encourage the development of community addiction programs and support groups
	Local purchases	• Communities may benefit from the sale of goods and services	• Determine any required goods and services by the company • Explore possible partnerships and capacity-building for small- to medium-sized enterprises
Cultural	New people in the community	• New workers may arrive with different culture • Challenges to traditional ways of life	• Offer cultural awareness training for the company, delivered by members of the community, to ensure new people in the community understand its values and traditions
	Population increase through in-migration	• Any increase in population may strain existing services	
	Rapid cultural change	• Change can happen quickly with increased development of infrastructure, roads, and as goods and services are introduced to local communities	• Develop partnerships and promote sustainable development and cultural conservation of traditional knowledge

2.6 How Can Aboriginal Communities Get Involved in Mine Development?

Community participation and involvement are very important during the development and construction phase of the mineral development cycle. They allow communities to prepare for a growing number of project activities, impacts, and benefits. During mine development, formal consultations with nearby communities, both Aboriginal and non-Aboriginal, are carried out. Aboriginal communities can provide input by reviewing project descriptions, leading traditional knowledge studies, and developing Participation Agreements or Impact and Benefit Agreements with the mining company. Through the engagement process, communities can gain a better understanding of the project, help the developer understand the potential impacts from their perspective and knowledge base, and raise issues of concern. Site visits may also be scheduled. Aboriginal Elders often visit the site so they can better see what is being proposed on what may be considered traditional lands.

An important area in which communities can participate in the development phase is through the EA process. Comments and input provided by communities can change the outcomes of the project.

To get the most out of consultations, communities may want to prepare in advance by doing the following:

- Identifying potential impacts that need to be considered in project development;
- Conducting a skills inventory of residents interested in working at the mine;
- Beginning skills training;
- Identifying community business opportunities and capacities;
- Identifying the service and labour needs of the project;
- Setting up ways to communicate for current and ongoing consultations (i.e., key contacts); and
- Assessing the needs for advice and information gathering.

In addition, having community development and infrastructure plans in place before development can be of great value to a community during the mine development. Communities should enter into discussions with government agencies as early as

Facts and Figures

Exploration and mining companies, in addition to complying with regulatory regimes at the federal, provincial, and territorial levels, are voluntarily adopting environmental management practices, including the application of traditional knowledge, to respond to community concerns about the potential effects of mining.

possible during the licensing and permitting process.

Facts and Figures

Aboriginal peoples can work with the mining company to ensure that great care is taken to protect historical and sacred sites, as well as migration routes and traplines, before mining starts.

Traditional knowledge is an area where Aboriginal community input is significant. It provides information about traditional land uses, alerts developers to the migratory patterns of wildlife, and informs developers about sensitive areas (hunting areas, cultural sites, migratory routes, etc.). It may also be used to help identify environmental impacts, evaluate how serious they are, and select ways to reduce any potential negative effects. Traditional knowledge is increasingly being recognized as an important part of an EA. Its input into the process can assist in an EA in many ways. For instance, traditional knowledge can contribute to the building of EA and traditional knowledge capacity within Aboriginal communities and build awareness in non-Aboriginal communities.

Provincial/territorial authorities and federal government departments may have programs to help communities and individuals take advantage of opportunities during mine development. Communities may decide to set up a number of committees during the mine development process to ensure impacts are recognized and mitigated. Possible committees include:

- A committee to review the environmental impact statement;
- Environmental and socio-economic monitoring committees;
- Community wellness committee;
- Business development opportunities committee;
- Training/hiring committee; and
- Community sustainability upon mine closure committee.

2.7 Community Employment and Other Economic Opportunities

This sub-section identifies the possible employment and economic opportunities available to Aboriginal communities during mine development. It describes best practices for maximizing economic opportunities.

What Are the Employment Opportunities?

Communities can experience huge increases in employment during mine development depending on the size of the mine. A wide variety of jobs, from

entry-level to professional, are available during mine development (see Jobs and Education table below). The mine developer and its contractors are the major employers. Other employment sources are secondary support industries and service providers.

Communities and the mining company are encouraged to work closely at the earliest opportunity to develop good relationships and partnerships in the areas of training and employment.

Ensuring that community members are trained and available to work is necessary if communities are going to take full advantage of any employment opportunities.

For a good description of the jobs available during the development and construction phase, check out the *Mining Industry Human Resources Guide for Aboriginal Communities* at www.aboriginalmining.ca/en/development/careers.asp.

JOBS AND EDUCATION

Type of Job	Education Requirements	Examples
Entry-level	• Grade 12 education or equivalent • If a community does not meet this, it can talk to the mining company about waiving the requirement for a period • This can encourage young people to stay in school and allow time to meet the requirement	• Trades helpers • Heavy equipment operators • Housekeeping services
Semi-skilled	• Grade 12 education or equivalent • Some work experience	• Warehouse technicians • Administrative assistants • Trades occupations
Skilled	• College diploma or trades certification	• Trades occupations • Safety coordinators • Environmental technicians
Professional	• University degree	• Managers • Engineers • Geologists • Scientists • Accountants

What Are the Other Economic Opportunities?

Communities can experience significant economic development opportunities during mine development and construction. These opportunities include infrastructure development and the provision of utilities. Some of the key potential business opportunities are:

- Contract mining (underground, and open-pit);
- Supply of goods (e.g., oil and gas, safety equipment);
- Catering and housekeeping;
- Site services;
- Surveying;
- Trucking;
- Construction services;
- Recycling and waste disposal services;
- Aircraft support;
- Airport maintenance;
- Road maintenance;
- Laboratory services;
- Consulting (e.g., environmental, socio-economic, community development); and
- Goods and services associated with a community development project (e.g., an arena).

Business opportunities will increase as a project moves through the different steps of mine development. Communities can prepare by asking these questions:

- What businesses are currently available?
- What businesses are required?
- What are the capabilities of the community?

Communities can play an active role in increasing the type and amount of economic development opportunities available to them by:

- Hiring a professional business manager to maximize their benefits from a project. These skills may be available in the community or a community may need to look outside to fill this need;
- Holding their own internal consultation with their membership to determine what businesses might be of interest to the community members, and identify opportunities that might be sustainable once the mine closes (e.g., transport, supply of business services);
- Developing their own business and training capacity;

- Being creative and imaginative during the negotiation of any agreements;
- Beginning discussions about the development of partnerships with the mine developer as early as possible;
- Taking an inventory of the community's assets;
- Speaking to members from other communities; and
- Taking long-term perspectives (closure issues, training, strategic planning of resources).

Joint Ventures

Initially, Aboriginal communities may want to develop "joint-venture" (JV) businesses with established companies. A JV is a simple business arrangement between two companies or between an Aboriginal community and a company capable of supplying services or materials to a mining company.

A JV agreement defines the relationship between the two parties and specifies the training and employment opportunities. It also defines how profits from the JV business activities will be distributed.

JVs are an excellent way to develop local business capacity to prepare for and take advantage of business opportunities related to mine development. Through a JV, a community business can increase the scope and range of its current services in order to help meet the service and support needs of the mine developer. JVs may be developed

Facts and Figures

Rescan Tahltan Environmental Consultants (RTEC) is a JV between the Tahltan Nation Development Corporation (TNDC) and Rescan. RTEC conducts environmental assessments of projects in Tahltan territory. Its services include environmental consulting (fisheries, terrestrial, atmospheric services), ecological risk assessments, environmental effects monitoring, tailings management, reclamation/site closure, water treatment, and social and economic sciences. TNDC has partnerships with more than 20 companies, providing such services as bridge construction, communication, drilling, environmental, medical, pipeline and power line construction, safety, and transportation.

related to logistics support, the provision of goods and services, and in a number of other areas such as catering, fuel supply, housekeeping, and environmental consulting. In addition to increased business opportunities, JVs can also increase training opportunities for community residents.

The process of building a business base in a community takes time as capacity is developed. A good example of this comes from the Northwest Territories where two large diamond mines were developed within five years of each other. As communities and local businesses gained experience, they increased their capacity and were much better equipped to take advantage of the opportunities presented by the second development. Businesses may grow when longer-term contracts become available during mine operation.

Facts and Figures

The Voisey's Bay Nickel Company negotiated separate Impact and Benefit Agreements with the Innu Nation and the Labrador Inuit Association (LIA). These agreements established specific employment objectives for Aboriginal peoples and identified specific business opportunities for Aboriginal companies and joint ventures. Aboriginal companies were awarded procurement/construction contracts worth more than $500 million.

Source: Voisey's Bay Nickel Company.

Negotiation of Agreements With Economic Benefits

There are a number of agreements that may be negotiated between Aboriginal communities and mining companies at any phase of the mineral development cycle. The communities and the mining company will develop agreements (such as Letters of Intent, Memoranda of Understanding, Impact and Benefit Agreements, or Participation Agreements) that are mutually beneficial. While there are commonalities among the agreements, each one is tailored to the specific needs and wants of the parties and the phase of the project.

These agreements may include:

- Preferential hiring practices for Aboriginal workers;
- Training;
- Educational and apprenticeship opportunities;
- Economic development and business opportunities;
- Social, cultural, and community support programs;
- The protection of areas of spiritual or cultural significance; and
- Compensation for adverse environmental effects.

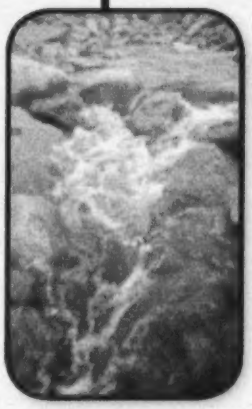
Letter of Intent

Often seen as the first agreement, a Letter of Intent is a document that sets out, in writing, the serious intent of the companies to carry out certain activities. It is an acknowledgment of a willingness and ability to do business, and signals a desire to have further agreements if the mining company

finds an economic deposit. It is not an enforceable contract, but may be part of preliminary activity leading to a business arrangement.

Memoranda of Understanding (MOU) and Exploration Agreements
These agreements may be negotiated during the early stages of exploration and mine development. They define the principles for working together for mutual benefits, and are simple ways to create an understanding between a community and an exploration company. MOUs or Exploration Agreements may develop into a more formal agreement (e.g., an Impact and Benefit Agreement) as the project progresses.

Impact and Benefit Agreements (IBAs) and Participation Agreements (PAs)
Once a company has made a commitment to develop a property, it may begin the process of developing IBAs or PAs with local Aboriginal communities. These agreements might include guidelines for hiring, business opportunities, and training and scholarships. They may make provisions for the preferential hiring of Aboriginal persons and may discuss how and when community members might receive training. They may also include provisions for some form of revenue-sharing arrangement and payments to offset the costs associated with administrating the agreement.



An agreement will also likely explain the tendering process for business contracts, outline any preferential treatment for Aboriginal/community businesses, and require the unbundling (breaking up) of larger contracts. These agreements become confidential legal contracts. They will only be made public if agreed to by the community and the mining company.

Facts and Figures

Detour Gold and the Métis Nation of Ontario have signed an Impact and Benefit Agreement (IBA) with respect to the development and operation of the company's Detour Lake gold mining project in northeastern Ontario. This first-of-its-kind IBA between a mining company and a Métis community includes provisions on how the Métis community will benefit from the development of the Detour Lake project and throughout the life of the mine, including employment and business opportunities, training and education initiatives, and financial participation in the project. The IBA also establishes a Métis scholarship and bursary program at College Boreal and Northern College. It reflects Detour Gold's commitment to protecting the environment and wildlife, and supporting the community's social and cultural practices in a spirit of continued cooperation.

Sources: www.detourgold.com and http://metisnation.org.

2.8 Community Experiences: Nuna Group of Companies

Nuna was formed in 1993 and is 51% Inuit owned. Nuna ownership consists of Nunasi Corporation (25.5%), Kitikmeot Corporation (25.5%), and Nuna Management Group (49%).

The Nuna Group of companies provides a large range of services, including contract mining, drilling services, provision of construction and mining products, site support, heavy equipment simulator contract training, and winter road construction.

Community Summary and Involvement

All Inuit enrolled under the Nunavut Land Claims Agreement are shareholders of Nunasi Corporation, a Nunavut-wide Inuit economic development corporation charged with the responsibility of undertaking business operations that profit shareholders socially and economically.

Since its inception, Nuna has been involved with the majority of resource companies operating in the Northwest Territories and Nunavut, and has expanded its operations into Saskatchewan and Ontario.

The hiring and training of Inuit, Aboriginal, and local staff have been a focus of Nuna's, resulting in the company having, among owners and contractors, the highest percentage of local residents working on projects in which Nuna is involved. Its ongoing education programs and training opportunities allow the labour source not only to grow, but to advance to provide proficient operations managers in the future. Nuna's work force at various times exceeds 600 people working on various projects in the North. Nuna has succeeded in employing in excess of 55% northern staff at its operations over the past several years.

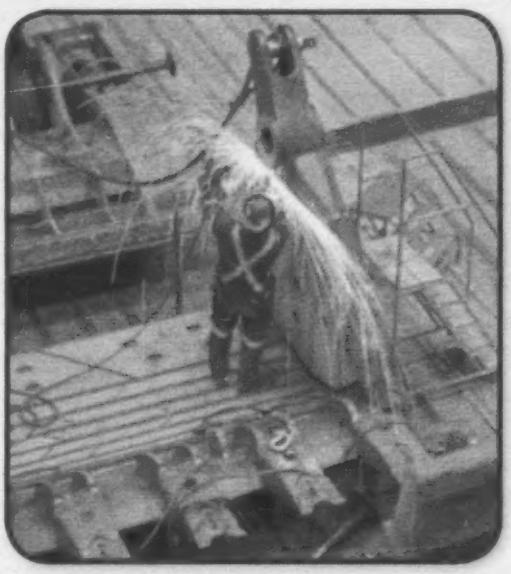
Nuna also has several successful joint ventures and partnerships with Aboriginal groups throughout Canada. This diversity provides a unique opportunity for sustainable employment options for people that possess or have acquired the necessary skill sets that could be transferable to other Nuna projects in other communities, provinces, and territories. This provides an avenue to develop the sustainable trade and business skills necessary for long-term capacity-building. In all cases, Nuna's practice is to source the local Aboriginal labour followed by local labour within the affected communities as a first step, and then supplement with other Aboriginal labour if a demand exists and project economics permit.

Successful Approach

The work in progress is monitored daily by management in order to maintain consistent cost control and schedule performance, and to ensure the satisfactory achievement of overall client objectives.

A high level of communication is maintained by all concerned, and clients receive regular and detailed progress briefings at every stage of development.

For more information, contact www.nunalogistics.com.



Nuna also has several successful joint ventures and partnerships with Aboriginal groups throughout Canada.

3 MINE OPERATION

3.1 What Is Mine Operation?

3.2 What Are the Mine Operation Activities?

3.3 Who Are the Main Players in Mine Operations?

3.4 Acts and Regulations

3.5 Environmental and Social Impacts

3.6 How Can Aboriginal Communities Get Involved in Mine Operation?

3.7 Community Employment and Other Economic Opportunities

3.8 Community Experiences: Diavik Diamond Mine

3 MINE OPERATION

The operating life of a mine can be as short as several years or as long as several decades.

This section explains the purpose, main activities, legal framework, and major players of mine operation. It also outlines opportunities for Aboriginal communities to get involved during this phase.

3.1 What Is Mine Operation?

Mine operation is the third phase of the mineral development cycle. It is the process of producing a mineral product for the benefit of society, **stakeholders**, and shareholders. A mine is operating when earth and/or rock are being excavated from the ground and the processing plant is producing **saleable** product.

There are two main types of mines: underground and open pit. An open pit is used when the mineral resource is located at or near the earth's surface. An underground mine is constructed when a mineral resource lies too far below the surface to safely construct and operate an open-pit mine. Underground mines include man-made shafts and inclined ramps to access and extract the rock.

A mine operation has four main work areas: excavation areas, processing plant, waste storage, and supporting services. The excavation areas are where earth and rock containing the mineral are excavated. The processing plant or mill concentrates the rock that contains saleable material. Some mine operations do not have a processing facility on-site so the mined material is sent somewhere else to be processed. Waste storage facilities include areas for both waste rock and the material rejected from a mill (called tailings). Supporting services to a mine operation may include repair shops, labs to test the quality of the mined material, change rooms, living quarters, warehouses, and offices.

Every mine operation has mining and processing target rates. One key element is to determine rates of mining and processing that ensure all costs can be covered from product sales. These rates are evaluated during the feasibility studies before a mine starts operating. The rates are calculated to provide the highest level of efficiency (need to match the capital investment, size of **orebody**, and life of the mine). Producing too much, too fast could

increase costs and hurt profits while producing too little, too slowly could hurt the economics of the mine because of reduced sales. The mine and the process must be designed and built to achieve the right balance.

Time Frames

The operating life of a mine can be as short as several years or as long as several decades. It can also be seasonal, or operations can be year-long and shipments can be seasonal (if access is difficult). Overall revenues must be able to at least recover exploration and construction expenses. Factors that affect how long a mine will operate include:

- Commodity price (shaped by demand in the world market);
- Production costs and production rates;
- Quality (grade) and quantity of ore that is economic to mine in the deposit;
- Size and shape of the body of material to be mined;
- Best possible economic mining rates;
- Mining methods, equipment, and associated costs;
- Depth of mining required below surface;
- Ground conditions and ability to mine safely; and
- Location.

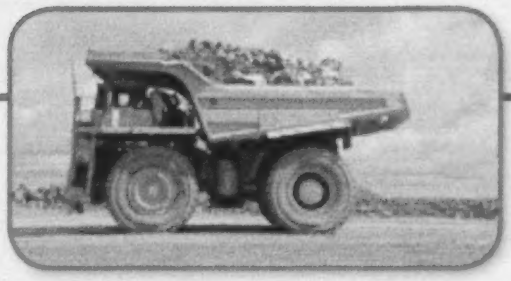
Costs

Mining requires labour, capital, energy, and other inputs, all of which cost money. During mine operations, labour is usually the highest cost. Power, fuel, and other consumables (heavy equipment, drill bits, tires, spare parts, etc.) are the next greatest expense.

The location of a mine has a major effect on both construction and operating costs. If the mine is located in a remote area, the mine operator may have to build a winter road to bring in supplies and take out ore or concentrate, as well as a diesel power plant to generate electricity. A major expense for remote mines is transportation costs to fly workers in and out of the mine. However, if the mine is located in a less remote area, it may be on an existing road system and close to power grids, or the government may agree to provide a road for access and power to help lower costs.

Facts and Figures

Generally, with higher metal prices, lower-grade rock becomes ore. However, when the price of metal is lower, only higher-grade rock is able to be used as ore.



3.2 What Are the Mine Operation Activities?

Facts and Figures

To answer the needs of mining companies and mining workers, the Quebec government, together with various organizations, has developed a training program for underground mining. This program delivers training to Cree students in cooperation with the Cree School Board.

Source: www.cfpvaldor.qc.ca.

Hiring

When a mine goes into operation, it needs to hire both permanent employees and contractors. Companies will advertise in local, regional, and national papers, depending on the jobs to be filled. Some companies may have agreements (e.g., IBAs) to work directly with Aboriginal groups to find and hire local candidates (for example, Voisey's Bay in Newfoundland and Labrador, the Diavik and Ekati diamond mines in the Northwest Territories, Raglan in Quebec, Musselwhite in Ontario, and Eskay Creek in British Columbia).

If local communities do not have candidates with the required skills and professional qualifications, the company must look "outside" and the recruitment search is extended regionally, nationally, and sometimes internationally. Companies prefer to hire locally where people already live. The local candidates are already close to mining sites and know about the land, geography, and climate.

Training

All new employees receive orientation training before starting on the job. This training helps employees understand the operation, but more importantly, ensures they are safe on the job. Other training for new employees includes on-the-job training, cross-cultural training, trades training, apprenticeships, and literacy and life skills training. Training can be delivered in classrooms, by computer-based programs, and by one-on-one instruction and mentoring. Companies may partner with local communities, government, and others to provide community-based training. Other companies may partner with local colleges and schools to provide technical training.

Commissioning

Commissioning involves testing to see whether a new facility, process, or equipment performs as it was designed. All processing and mining equipment must be commissioned before going into full production.

Production

During production, waste rock must be mined away to recover the ore. Ore and waste both cost money to excavate and process; therefore, to be efficient, mines try to mine as much ore and as little waste as possible.

When an operation starts up, a lot of waste must be excavated in order

to reach the ore. In underground mining, this is called preproduction development. In open-pit mining, this is called pre-stripping. This early stage of mining can last from a few days to more than a year depending on how much waste there is and how fast it can be removed. Mine production begins after the waste has been removed and the ore is exposed and sent to the processing plant. Throughout production, waste and overburden must still be excavated so more ore can be uncovered. This process is crucial to maintain production.

Full production generally means that the average mining and processing rates are meeting or exceeding the target rates developed during the feasibility study phase. Improved market conditions may allow a mine to sell more product than planned and/or to sell it at a higher-than-expected price. When this happens, the mining company will try to increase production. Sometimes a mine operation can increase production for a short time using its existing equipment and people, but the only way to achieve permanent increases is to expand the mine.

Mine Expansion and Contraction

When the economy is strong and financing is easily accessible, mining companies may take the opportunity to expand. Mine expansion can include:

- Enlarging the existing mine;
- Opening up more mine areas;
- Buying more equipment and hiring more people;
- Expanding the processing plant to process more ore;
- Changing the processing plant to process faster; and
- Doing more exploration work to try to find more ore.

But, when the economy is weak and mining companies do not have as easy access to affordable loans, mines may undergo a contraction period, which may include:

- Decreasing the size of the mined area;
- Reducing mine production;
- Selling assets;
- Reducing employment and services contracting; and
- Halting exploration work.

3.3 Who Are the Main Players in Mine Operations?

The table below summarizes the major players and their potential roles and responsibilities during mine operations.

MINE OPERATION: WHO ARE THE MAIN PLAYERS?

	Potential Roles and Responsibilities
Communities	• Review and implement provisions of its agreement with the mining company to stimulate business opportunities • Review the tendering provisions of the agreement (as mining companies sometimes break tenders into smaller pieces, which provides more opportunities to Aboriginal communities) • Discuss opportunities with the mining company • Constantly evaluate and implement ways to maximize training, employment, and business opportunities
Governments (provincial, territorial, federal)	• Inspect operations to ensure compliance with applicable permits, licences, or authorizations • Collect royalties and taxes
Junior exploration companies	• Sell all or most of its ownership to a senior company, with some exceptions
Senior mining companies	• Plan, develop, manage, and operate mine (sole or majority owner) • Sell the product • Visit and provide updates on mine operations to affected communities • Help design and conduct community-based training
Contractors/service providers	• Consulting firms – provide specialized knowledge and capability, e.g., rock and soil mechanics, safety, engineering, occupational heath and ergonomics, labour relations, etc. • Equipment suppliers and manufacturers – assemble, commission, and maintain equipment • Helicopter services • On-site explosives manufacturing • Geological services • Caterers
Industry associations (provincial, territorial, national)	• Represent mine developer's interests • Influence government mining policy • Provide a forum for shared research and best practices
Customers	• Immediate customers – smelters, refineries, steel mills, and various manufacturing plants • Final customers – retail consumers of everyday goods and services that contain materials from the ground; they drive the markets that influence the selling prices

3.4 Acts and Regulations

This sub-section identifies the general legal and regulatory environments for the mine operation phase. The actual licences and permits that a mine needs to operate depend on what jurisdiction the mine falls under.

Government passes acts and enables regulations to ensure mining occurs in a safe and environmentally friendly way. Companies must comply with the requirements of both federal and provincial/territorial acts and regulations.

What Are the Conditions of Leases?

Leases are issued by the provinces and territories, with the exception of Nunavut, the Northwest Territories, and on Indian Reserves where leases are issued federally by Aboriginal Affairs and Northern Development Canada. The leases set the boundaries where certain infrastructure can be built or deposited (i.e., tailings or waste rock piles) and set requirements on how to operate environmentally. Provisions such as a mine closure and reclamation plan, a yearly lease fee, and large security deposits are generally attached to the lease.

The life of the mining lease varies by province and territory. The sub-surface leases have a term of up to 21 years depending on the jurisdiction, whereas the surface leases have a term of up to 30 years. Some jurisdictions impose certain conditions upon the renewal of mining leases (e.g., the property must be the site of an active or closed mine).

What Are the Conditions of Licences and Permits?

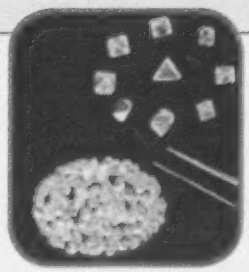
Government agencies issue licences, permits, or authorizations, and enforce the terms and conditions. The pieces of federal environmental legislation that most often apply to mine operation are the:

- *Canadian Environmental Protection Act* (CEPA);
- *Fisheries Act*;
- *Explosives Act*; and
- *Navigable Waters Protection Act*.

For example, in the case of operating metal mines, the Metal Mining Effluent Regulations apply. These are regulations under the *Fisheries Act*. There are also regulations administered by the Mines Inspector, which are under provincial/territorial jurisdiction.

Facts and Figures

The diamond mines in the Northwest Territories use community-based consultation programs. They have Participation Agreements that are Aboriginal community-based. The boards report to the communities and publish annual reports. Update meetings are held annually in each of the participating communities.



The following list shows some of the permits, licences, and other instruments that may be required to operate a mine depending on its jurisdiction:

- Fisheries authorization permit: Issued by Fisheries and Oceans Canada to allow a company to alter fish habitat;
- Navigable waters permit: Issued by the Coast Guard to allow for the construction of any structure in a lake or river that is considered navigable;
- Explosives permit: Issued by Natural Resources Canada to allow the storage and mixing of explosives at the mine site, it also sets required distances away from other buildings and from waterways;
- Water licence: These provincial/territorial licences set conditions for water use, waste disposal, and water discharge;
- Quarry permit: Provincial/territorial permit to operate at the site;
- Aggregate permit: Provincial/territorial permit on the extraction and use of aggregate;
- Transmission line permit: Provincial/territorial permit required when a new transmission line is built; and
- Domestic sewage permit: Provincial/territorial permit for the treatment and disposal of domestic sewage at the mine site.

Facts and Figures

Under a Socio-Economic Monitoring Agreement between Diavik Diamond Mines Inc. and the Government of the Northwest Territories – an agreement to which the five neighbouring Aboriginal groups are signatories – Diavik funds an Environmental Monitoring Advisory Board to provide advice and oversee environmental issues. The majority of the Board members are appointed by Aboriginal communities.

Other Instruments

Agreements such as Impact and Benefit Agreements (IBAs) are not conditions of regulatory approval in areas without overarching land and self-government agreements. However, governments strongly suggest that mining companies negotiate such agreements. IBAs may contain a wide variety of provisions, including environmental monitoring provisions. Often, Aboriginal communities actively participate in monitoring under these agreements. Regulatory approval may require impact monitoring agreements involving government agencies, First Nations, and mining companies.

3.5 Environmental and Social Impacts

This sub-section identifies the potential environmental and social impacts a community may experience during mine operation, and includes ideas for monitoring, mitigation, and community input.

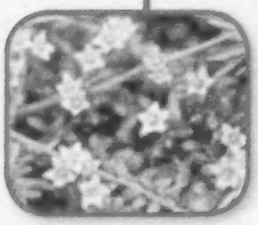
What Are the Potential Environmental Impacts?

In each phase of the mineral development cycle, the intent is to minimize and mitigate the potential environmental impacts on water, land, air, wildlife, and people. By the time a mine begins operation, the potential impacts are well understood and can be mitigated effectively by using a combination of traditional knowledge and appropriate technologies.

The following table outlines the type of impacts possible during mine operation and the mitigation measures.

ENVIRONMENTAL IMPACTS

Type	Activities and Potential Impacts	Mitigation
Land use	• Land disturbance from mining activities, i.e., excavations in the mine, storage of waste rock • Tailings waste and tailings dams	• Comply with government regulators • There are strict rules for locating, constructing, and operating
Air quality	• Dust from roads and mining activities • Emissions from trucks and on-site power generation	• Apply water to roads to control dust • Monitor emissions to determine effects on vegetation and air quality
Water quality	• Dirt, rocks, or contaminated or unclean water enters streams or lakes • Impacts on water flows	• Establish a water management plan (must be approved by the government) • Train employees and contractors on the water management plan • Monitor water quality and adjust flow supplementation
Wildlife	• Animals attracted to garbage and food waste • Migratory patterns affected by the presence of humans, noise from aircraft, and blasting • Impacts on fish and fisheries	• Use best practices for incineration of food waste and garbage • Remove waste that cannot be incinerated • Establish a waste management plan and employee training to help minimize wildlife impacts • Observe animal behaviour and modify operations as required • Avoid certain activities during migration • Protect spawning and rearing areas and fish farming
Cultural	• Disturbance of archaeological and heritage sites	• Protect land, and identify and protect archaeological and heritage sites



What Environmental Monitoring Is Required?

Companies and governments continually monitor the mining operation to test environmental performance, demonstrate compliance with environmental legislation, refine operational practices, and safeguard the interests of both the mining company and the surrounding community. If negative changes are identified, the company can respond to the changes to prevent any long-term damage. Some changes are noticed immediately through monitoring (e.g., water samples) and others take a longer time to determine trends and impacts (e.g., wildlife monitoring). The basis for knowing that changes have occurred is the baseline studies that began early in the advanced exploration stage.

During mine operation, the government and mining companies monitor:

- Waste water;
- Wildlife;
- Air quality;
- Water quality and quantity;
- Aquatic effects;
- Fisheries and fish habitat; and
- Reclamation activities.

Monitoring results can provide useful input to ongoing liaison between the mining company and the surrounding community.

Aboriginal representatives from the area may participate in or conduct these monitoring programs and studies. This can be done through informal arrangements or a more formal community monitoring committee. Although rare, external monitoring agencies (independent) may be formed to act as a watchdog. These agencies ensure that companies meet their regulatory requirements and they check that the regulators are doing their job.

What Are the Potential Social Impacts?

Mine operations have risks and opportunities for nearby communities. By identifying them, communities can work to reduce the negative impacts while gaining maximum benefits from the development.

The following table describes some of the possible negative and positive impacts and responses to them.

SOCIAL IMPACTS

Type	Activities and Potential Impacts		Solution
Social	Shift/rotational work	• Less time to spend on traditional activities • Workers and their families may be separated for several days or weeks	• Plan activities around work schedule • Create support groups or programs to minimize the separation stress experienced by families • Work with the changing dynamics of the community
Economic	Community partnerships and alliances developed	• Increased business opportunities • Wealth generation	• Improve community infrastructure where possible
	Increased employment	• Training and skills development opportunities • Creates positive role models	• Use the positive working role models within the community as examples
	Increased income	• Widens gap between employed and unemployed • A sudden influx of money may lead to increased substance abuse	• Establish or encourage the development of community addiction programs and support groups • Create an information campaign
	Wage economy	• More money in the community • Local community businesses can prosper • Personal wealth increases	• Ensure that the work is distributed in all communities
Cultural	Strangers in the community	• Increased population • Increased funding for traditional activities • Strains existing services • Aggravates existing social problems	• Offer cultural awareness training, delivered by community members, to make new people aware of the values and traditions of the community • Support and maintain traditional activities

3.6 How Can Aboriginal Communities Get Involved in Mine Operation?

There are long-term opportunities for community participation during the operation phase. Mining companies and communities will most likely be enjoying a positive relationship in this phase if engagement activities were successfully implemented in earlier phases. These engagement activities can lead to community strengthening and development in the operation phase.

The type and amount of community input and communication depend on many things and will vary from community to community.

Companies and communities may consider communicating and exchanging information on a regular basis. This approach may involve community visits to provide updates on the operations. It can also help prepare communities for closure, which is the next phase in the mine life cycle.

Companies may also publish project updates in newsletters and local newspapers. They may bring young people and Elders to the site, host community visits, meet with community employment officers, conduct community-based training, and meet with chiefs and council.

Companies may also visit local schools to encourage students to stay in school and may attend career shows in schools to emphasize the types of jobs available and the education required. They may also visit communities to gain a better understanding of the lifestyles of their workers.

3.7 Community Employment and Other Economic Opportunities

This sub-section identifies the employment and economic opportunities available to members of Aboriginal communities during mine operation. It provides information on the types of jobs, wages, and training opportunities. It also lists specific actions a community can take to increase its economic opportunities and benefits.

What Are the Employment Opportunities?

Employment and training opportunities are a significant benefit for a community during mine operation. As a mine goes into operation, the percentage of local workers employed increases with the mine employing hundreds to sometimes thousands of workers overall.

Careers in the mining industry are very diverse, with jobs varying from trades to highly specialized positions. Wages also vary, but typically the average mining wages are the highest of any industry in Canada. Actual wages depend on the type of mine, location, nature of the job, and supply and demand for workers.

The table below lists the types of jobs in a typical mine operation.

Recruitment

Companies follow standard procedures when recruiting employees. They conduct interviews and ensure that potential employees pass pre-employment medical and security checks. Based on its relationship with the mining company, a community should be well aware of current and future job opportunities. A community may also have a human resources committee that includes company representatives dedicated to assisting community members find jobs at the mine.

A new world of opportunity can open for a person hired by a mining company. From basic training to skills enhancement, and from career planning to apprenticeships, important opportunities will unfold for new employees. The training will provide long-term, often transferable, skills and can contribute to community sustainability.

TYPICAL JOBS IN A MINE OPERATION

Miners	Carpenters	Computer technicians
Heavy equipment operators	Geologists	Human resources managers
Pipe fitters	Safety experts	Security officers
Environmental scientists	Clerks	Health and safety coordinators
Accountants	**Assayers**	Janitors
Administrators	Truck drivers	Construction workers
Laboratory technicians	Electricians	Landscapers
Community relations officers	Welders	Nurses
Drillers and blasters	Surveyors	Lawyers
Mechanics	Engineers and technicians	Marketing personnel
IT specialists	Instrumentation technicians	Cooks and catering staff

Facts and Figures

The management team of the Raglan mine renewed its sustainable development policy specific to the operation of a northern site. The policy aims to emphasize the characteristics of the mine, its geographical location, and the partnership with the Inuit communities of Nunavik.

Source: www.xstratanickelraglan.ca.

What On-the-Job Training Opportunities Exist?

Training programs may be tailored to each community based on the community's working relationship and/or agreements it has in place with a mining company. Mine operations usually have a number of positions for trade apprentices. Apprentices work under a journeyman for a certain amount of time, getting paid while they learn a specific trade on the job. Job-specific training for non-apprentices is also available, including training on equipment, procedures, and their importance to the overall process.

In addition, mining companies will often provide support when an employee finds a course outside of the company that can help job performance. This kind of personal development is usually expected to take place outside working hours on the employee's own time. In some instances, the company may allow time off, with or without pay, if the course takes place during company time. However, financial support for course fees, books, and travel costs is usually available and includes either full or partial reimbursement after successful completion of the course. Anything from a one-hour seminar to a complete

Facts and Figures

Tli Cho Air purchased its own multi-million-dollar Dash 7 aircraft and has since won two multi-year, multi-million-dollar contracts serving the Ekati and Diavik mines. The company provides all scheduled service flights to the Tlicho communities of Whati, Wekweeti, and Gameti working in partnership with Air Tindi, which conducts all flight operations.

Source: Tli Cho Air.

Facts and Figures

The Mining Industry Human Resources (MiHR) Council offers a number of tools that are relevant to employers, potential workers, and civic leaders in Aboriginal communities:

- ***Mining Industry Human Resources Guide for Aboriginal Communities:*** *provides training resources and career opportunity information;*
- ***Explore for More:*** *a web site geared to promoting careers in mining;*
- ***Canadian Mining Credentials Program:*** *designed to establish the skills and training requirements for mining occupations across Canada; and*
- ***Mining Essentials: A Work Readiness Training Program for Aboriginal Peoples:*** *a pre-employment training program that teaches essential and work-readiness skills required by the mining industry for entry-level positions.*

Source: www.mihr.ca.

university degree by distance learning can be supported under these types of programs.

Mining companies sometimes create special initiatives for employees. Examples include literacy programs, completion of secondary school general equivalency degrees (GED), pre-trades programs, community-based training, life-skills training, drug and alcohol awareness and rehabilitation programs, and management development programs.

What Are the Other Economic Opportunities?

Opportunities for Aboriginal businesses that have provided services at the exploration and development phases become more substantial and longer term during mine operation. During mine development, business opportunities tend to be for one to three years, while during operations contracts may be for five or more years and may be renewable.

As in the mine development/construction phase, communities should continue to ask important questions about business opportunities, the community's capability, and joint-venture partnerships. Business opportunities available to communities are listed in sub-section 2.7.

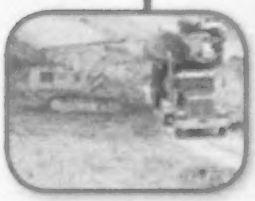
The community should review the provisions of its agreement with the mining company. For example, Impact and Benefit Agreements might be in place. These agreements are meant to stimulate business opportunities. They should also review the tendering provisions of the agreements. Mining companies sometimes break tenders into smaller pieces, which provide more opportunities for smaller Aboriginal businesses to participate.

Communities should also check with local, provincial, and federal government agencies for help and resources.

Facts and Figures

For its uranium operations in northern Saskatchewan, Cameco developed a policy statement and target for 35% of all goods and services to be sourced from northern-based Aboriginal-owned businesses. The company has employed a business specialist to assist communities in establishing businesses and to access financial resources or a business partner.

Source: Procuring From SMEs in Local Communities, A Good Practice Guide for the Australian Mining, Oil and Gas Sectors, 2010.



3.8 Community Experiences: Diavik Diamond Mine

Diavik Diamond Mines Inc. manages and operates the Diavik diamond mine located 300 kilometres northeast of Yellowknife in the Northwest Territories. The Diavik mine operates in one of the world's most remote and challenging environments: the sub-arctic tundra of Canada's Northwest Territories.

Community Summary

Before the mine was built, five local Aboriginal groups – the Dogrib First Nation, the Yellowknives Dene First Nation, the Kitikmeot Inuit Association, the North Slave Métis Alliance, and the Lutsel K'e Dene First Nation – entered into Participation Agreements with Diavik. The agreements solidify relationships and formalize Diavik's commitments to community capacity-building, long-term independence, and economic sustainability. Most agreements have formalized implementation committees that function to externally verify Diavik's performance on socio-cultural and economic aspects, and to provide recommendations for improvement.

Community Involvement

The mine employs approximately 1100 people, 55% of whom live in northern communities. Approximately half of the northern work force is Aboriginal. In addition to providing local employment, Diavik also provides local business benefits. Through mid-2012, northern spending totaled $3.8 billion. Furthermore, over 70% of the overall construction and operations spending since 2000 has been with northern businesses.

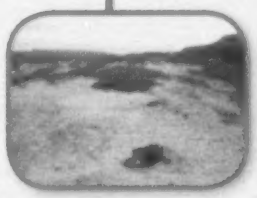
Communities are formally involved in monitoring and in an advisory capacity through the Environmental Monitoring Advisory Board created under the Environmental Agreement. The board includes representatives from the five neighbouring Aboriginal groups, governments, and Diavik Diamond Mines Inc. Communities are also involved through the

Diavik Communities Advisory Board under the Socio-Economic Monitoring Agreement and in implementation committees under its Participation Agreements.

Economic and Business Opportunities

Communities have realized many economic and business opportunities through their relationships with Diavik.

Twice a year, Diavik releases a socio-economic monitoring agreement report, providing a detailed summary of local training, employment, and business benefits for Northerners.



In the first half of 2012, spending with northern businesses totaled $146.7 million, or 62% of $237.6 million in total spending. Of the northern expenditures, $61.7 million was with Aboriginal businesses. Cumulative northern spending since 2000 is now $3.8 billion, or 70% of total spending.

Employment

In the first half of 2012, Diavik's northern work force averaged 642 people, 378 above its original plan. Aboriginal employment averaged 291 people, 131 above the company's original plan.

For more information, visit www.diavik.ca.

4 MINE CLOSURE AND RECLAMATION

4.1 What Is Mine Closure?

4.2 What Are the Mine Closure Activities?

4.3 Who Are the Main Players in Mine Closure?

4.4 Acts and Regulations

4.5 Environmental and Social Impacts

4.6 How Can Aboriginal Communities Get Involved in Mine Closure?

4.7 Community Employment and Other Economic Opportunities

4.8 Community Experiences: Polaris Mine Closure

4 MINE CLOSURE AND RECLAMATION

All governments in Canada have rules, legislation, and regulations covering the closure process.

This section defines mine closure and describes the reasons why all mines eventually close. It also explains the necessary role of a mine closure and reclamation plan and the legal and regulatory requirements. In addition, it outlines the primary mine closure activities, players, and opportunities for Aboriginal participation.

4.1 What Is Mine Closure?

Mine closure is the last phase of the mineral development cycle. Due to the nature of mineral deposits, they all have a finite life. While some deposits are very large and may generate a mine life of 50 years or more, other deposits may only produce a mine life of a few years.

Mines close for different reasons, but the two most common are:

- Running out of the ore resource; and
- Low commodity or metal prices, which make the mine uneconomic to operate.

Mine closure is the orderly, safe, and environmentally sound conversion of an operating mine to a closed state. Areas affected by mining activity should again become sound ecosystems in keeping with a healthy environment and compatible with human activities.

While closure is the last phase of the mineral development cycle, today planning for closure starts before the mine development stage. All governments in Canada have rules, legislation, and regulations covering the closure process.

Mine closure is usually one of the most discussed issues with governments, companies, and the public. Communities are concerned about what will be "left behind." All stakeholders want to ensure that there are no contaminated sites, now commonly referred to as "**legacy** issues."

Time Frames

The time frame for mine closure depends on many factors, including the size and complexity of the operation, the effects of the mine on the environment, and the extent of the regulatory review. Typically, it may take 2 to 10 years to shut down a mine. If long-term monitoring or treatment are required, it may take decades before closure is considered complete.

What Is a Mine Closure and Reclamation Plan?

Planning for mine closure starts during mine planning. The development of final plans may take years of study and detailed engineering before being completed. The public usually reviews proposals for closure during the public consultations that occur as part of a project's environmental assessment. Mining companies usually put great effort into ensuring public views and concerns are heard and addressed during this consultation process. Under existing legislation, mine owners must submit a mine closure and reclamation plan to the provincial/territorial and/or federal government.

A mine closure and reclamation plan for any mine is site-specific. It details how the mining company will close the mine site and return the surrounding land, as closely as possible, to its pre-mining state. Mine closure and reclamation activities include decisions on what to do with every component of the mine that was planned and put in place at the development phase, including, but not limited to:

- Buildings and other structures;
- Roads and airstrips;
- Tailings disposal facilities;
- Waste rock management, quarries, and open pits;
- Petroleum and chemical storage areas and facilities;
- Pipelines and electrical transmission lines;
- Sewage and waste disposal areas and facilities;
- Mine and site drainage systems;
- Mine workings;
- Mine shaft, adit (passage ways), and decline openings;
- Site water quality, including water flows leaving the site;
- Recycling of materials; and
- Re-vegetation of the site.

A mine closure and reclamation plan should also:

- Indicate how progressive reclamation of the site will occur during the life of the operation;
- Provide cost estimates to close and reclaim the mine;
- Prepare a plan for temporary closure of the mine;
- Develop a plan for post-closure monitoring of the site; and

Facts and Figures

When a mine has exhausted its mineral supply, the disturbed area must be cleaned up and restored according to a mine closure and reclamation plan.

- Ensure that the site is left in a condition that will require little or no long-term care and maintenance.

Mine closure plans should be flexible and utilize sound science and state-of-the-art engineering methods for protecting the environment and reducing environmental risks while ensuring liabilities are met. Good communication and consultation between governments, companies, and communities of interest will lead to the best solutions.

4.2 What Are the Mine Closure Activities?

Shut-Down

When all production has stopped, employees are progressively laid off leading up to the shut-down. A small labour force is kept on to permanently shut down equipment. The mine closure plan will indicate what types of skills are needed to shut down and demobilize equipment.

Before shut-down, the mine owner must notify various stakeholders,

Facts and Figures

Elliot Lake, Ontario, is an excellent example of alternate job creation and alternative land use. In 1996, the last of its 12 uranium mines shut down and 4500 jobs were lost. Using imagination and innovation, this former mining town recreated itself as a retirement haven. In addition, the city entered into a joint venture with Serpent River First Nation to establish a school of fine arts. There is even a field station focusing on mine reclamation and environmental research operating in the city.

This type of option will not be available to all communities, but it shows that, with creative thinking and imagination, communities can create positive opportunities out of mine closure.

including employees (and employee representatives if any), various levels of government (municipal, provincial and federal), media, mining associations, and any other interested party.

The mine owner will carry out a final review of the mine closure plan and submit any changes needed to government regulators for approval.

Decommissioning

Decommissioning follows mine shut-down. Small crews decommission (take apart) mining and processing facilities and equipment. Decommissioning includes:

- Draining hydraulic fluids and oils from mobile equipment;
- Draining pipelines;
- Removal and recovery of saleable equipment and parts;
- Clean-up and salvage of buildings;
- Recovery of warehouse materials, tools, and consumables (i.e., oils, grease, etc.); and
- Proper disposal of all waste.

Reclamation

Reclamation is the process of restoring disturbed land as closely as possible to its original condition when mining is finished. The process of reclamation can occur either during the life of the mine (progressive reclamation) or after the mine has closed. All mine sites must be reclaimed according to applicable governmental regulations. The process typically involves a number of activities, including re-shaping the land, restoring topsoil, and planting native grasses, trees, or ground cover.

Post-Closure

Environmental activities continue long after a company has finished mining an area. The period of post-closure activity and monitoring depends on the impacts and results.

Some mines may require long-term care and maintenance after closure. Examples include sites where:

- Mine discharge waters need to be treated;
- Tailings containment structures require periodic monitoring and maintenance; and
- Remediation technologies need to be monitored.

Facts and Figures

Crops of corn and canola thriving on what was once the tailings site of the former Copper Cliff mine near Sudbury, Ontario, are examples of significant innovations in green mining technology and sustainable mining practices.

Source: Natural Resources Canada.

Federal and provincial governments ensure that mining companies give adequate financial assurance . . .

4.3 Who Are the Main Players in Mine Closure?

The table below summarizes the major players and their potential roles and responsibilities during mine closure and reclamation.

MINE CLOSURE: WHO ARE THE MAIN PLAYERS?

	Potential Roles and Responsibilities
Communities	• Employees, families, and businesses affected by closure will engage in open and transparent discussion with government and industry
Governments (provincial, territorial, federal)	• Maintain and promote open and transparent discussions with the community, the public, and special-interest stakeholders • Enforce mining law and the terms of mining-related permits • Assess closure plans and make suggestions • Use funds provided by the company before mine operation, if improper closure
Prospectors	• Not applicable
Junior exploration companies	• Not applicable
Senior mining companies	• Responsible for full and proper environmental closure and reclamation of the mine operation • Maintain and promote open and transparent discussions with the community, the public, and special-interest stakeholders • Put closure plan into action, implement decommissioning activities, and monitor closure activities • Ensure reclamation is complete, so that funds from the initial deposit can be released back to the company
Contractors/consulting firms	• Provide services
Industry associations (provincial, territorial, national)	• Influence government mining policy • Provide a forum for shared research and best practices

4.4 Acts and Regulations

This sub-section identifies the jurisdictions, responsibilities, and liability issues associated with mine closure. It also outlines the conditions of licences and permits that apply during mine closure.

Who Governs Mine Closure?

Liability

The licensed mine owner is responsible for mine closure, decommissioning, reclamation, and post-closure. Federal and provincial governments ensure that mining companies give adequate financial assurance (e.g., a deposit or bond) to guarantee the costs of reclamation (including shut-down, closure, and post-closure). This ensures that the government will not be left with the responsibility of paying for a mine closure, as has happened in the past because abandoned mines become the property of the governments.

Facts and Figures

An abandoned or orphaned mine is a neglected mine site that has not been terminated and that has no responsible owner. These sites exist because the mine closed or was abandoned before the current rules and regulations were in place. Responsibility for the site reverts to the Crown, either provincially or federally depending on the jurisdiction. Fortunately, this is no longer occurring as current regulations ensure that mine owners are responsible for reclamation.

The assessment and remediation of orphaned and abandoned mine sites in Canada have received increased attention. The Government of Canada established the National Orphaned/Abandoned Mines Initiative (NOAMI) in 2002 to address this issue. NOAMI is a multi-stakeholder committee consisting of representatives of the Canadian mining industry, federal/provincial/territorial governments, non-governmental organizations, and Aboriginal groups. As part of the initiative, guiding principles were developed for meaningful community involvement in planning for and rehabilitating orphaned and abandoned mines and were published in the pamphlet entitled Best Practices in Community Involvement. For further information, visit NOAMI's web site at ***www.abandoned-mines.org****.*

Jurisdiction

In the provinces and the Yukon, provincial/territorial governments have acts and regulations that govern mine closure. The federal government is responsible for mine closure in Nunavut, the Northwest Territories, and on Indian Reserves. In addition to federal acts and regulations, much of the responsibility in the two territories now rests with local co-management boards.

Important federal acts related to mine closure include the:

- *Canadian Environmental Protection Act* (CEPA);
- *Fisheries Act*;
- *Canadian Environmental Assessment Act* (CEAA);
- Waters Acts of the Northwest Territories and Nunavut; and
- mine-site reclamation policies of Nunavut and the Northwest Territories.

What Licences and Permits Are Required?

During shut-down, government agencies usually issue new permits for closure and reclamation.

The reclamation permit covers decommissioning and reclamation. This permit may outline additional site-specific conditions and methods for the reclamation of open pits, underground openings, tailings, and waste rock. This permit will include an Environmental Effects Monitoring Plan, an assessment of stability of embankments, a site characterization plan, and financial assurance. Site-specific air and sewage permits may be required for certain jurisdictions.

The government body regulating the site will also need to approve the owner's monitoring plan. Where joint jurisdictions occur, an oversight committee comprising federal-provincial environment and mining agencies, as well as public representation, may be developed.

When government is satisfied that the operator has met the requirements for decommissioning and the objectives of the closure plan have been fully met, it will provide the mining company with a written acknowledgement of release and the site will be considered closed.

4.5 Environmental and Social Impacts

This sub-section identifies the potential environmental and social impacts a

community may experience during mine closure. Ideas for environmental monitoring, mitigation, and community input and response are included.

What Are the Potential Environmental Impacts?

Significant advances in mining reclamation methods and technology have minimized many of the negative impacts. Mining companies and governments are cooperating to develop cost-effective, long-term closure strategies.

The main potential environmental impacts during mine closure are listed in the table below.

What Environmental Monitoring Is Required?

Monitoring Plans

A monitoring program, based on the approved plan, is used to assess the effectiveness of reclamation and mitigation measures after site shut-down and to identify corrective actions where needed. The mining company, together with governments, will develop an environmental monitoring program to comply with the Metal Mining Effluent Regulations and conditions of regulatory approval. At some sites, a committee that includes governments, the mining company, and local communities will be created to monitor progress.

Time Frames

The length of the monitoring process is reviewed and confirmed when the mine closes, and depends on the potential environmental impacts and risks to the environment. If the site needs long-term care and maintenance, the mining company remains responsible for the site, including remediation of any additional environmental issues arising after closure. The monitoring period may be extended to ensure remedial objectives are met.

Facts and Figures

Myra Falls is the only mine in British Columbia that is located within a provincial park. All mining activities and the eventual reclamation and rehabilitation of the site fall under a park use permit. Constant environmental and safety monitoring is an integral part of the mine operation. Not only is recreation not affected, but mine tours have become an important attraction for park visitors.

Source: www.nyrstar.com.

ENVIRONMENTAL IMPACTS

Type	Activities and Potential Impacts	Mitigation
Land use	• Long-term stability of waste rock piles and mining slopes • Tailings containment structures	• Annual inspections until permanent stability is demonstrated • Periodic monitoring and maintenance
Water quality	• Acid rock drainage or metal leaching	• Water treatment

Facts and Figures

The Fort McKay First Nation in Alberta participated in a research project with Syncrude Ltd. on the potential to convert reclaimed oil sands to grassland and manage a wood bison population. Each year, Syncrude assists the community in arranging a bison harvest, and animals are donated from the Beaver Creek Wood Bison Ranch, which is co-managed by Syncrude and Fort McKay First Nation. The ranch is home to approximately 300 animals that graze on land reclaimed from Syncrude's mining operation.

Source: www.Syncrude.ca.

Environmental Audits/ Standard Practice

The mine operator or an independent contractor will usually conduct inspections and compliance audits of contractor activities during shut-down, decommissioning, and reclamation. Government regulators will do audits to validate the site inspection program and conformity to the closure plan.

Best practices for both regulatory and voluntary efforts include policies, programs, technologies, reclamation research, and other measures that have been found to be cost-effective and environmentally appropriate for the site.

What Are the Potential Social Impacts?

The immediate impact is the loss of jobs at the mine and income used to support activities in a community. Mine closure also has a direct and indirect impact on local employment, businesses, and the sale of goods and services. These economic impacts may magnify social problems or even create new ones. The key to lessening the social impact of mine closure is to have a plan in place from the start of the mine to deal with anticipated impacts.

The table below describes some of the possible impacts and how they can be minimized.

SOCIAL IMPACTS

Type	Activities and Potential Impacts		Solution
Social	Decrease in community capacity	• Loss of social services	• Acquire new resources and capacity
Economic	Loss of employment	• Reduction in income • Unused skills	• Assist with development of new economic opportunities
Cultural	End of employment phase	• Return to traditional skills	• Teach skills, mainly through Elders

4.6 How Can Aboriginal Communities Get Involved in Mine Closure?

The shut-down of a mine can be a difficult time for local communities. Communities can manage the impacts of mine closure by planning well in advance, communicating with the mining company and government, understanding the process, and providing input. Early planning, done with the mining company, can ensure that long-term community objectives are advanced well before the mine is closed. The goal is to develop strategies to lessen the negative impacts of the closure, obtain financial assistance if available, and identify post-closure employment and other economic opportunities. Even during mine closure, the mine can still create some value for the community in the form of jobs in reclamation, long-term maintenance, and environmental monitoring. Alternative job creation and economic activities following closure can also be identified. For instance, the community may be able to attract other industries because of its trained work force.

4.7 Community Employment and Other Economic Opportunities

This sub-section identifies the employment and economic opportunities that exist for Aboriginal communities during mine closure. It also includes information on retraining opportunities during mine closure.

What Are the Employment Opportunities?

Typically, only a small number of jobs are available during mine closure. The main jobs available are for:

- Trades personnel – to dismantle equipment;
- Equipment operators and mechanics – to complete the earth-moving work necessary for reclamation;
- Inspectors – to inspect, sample, and audit the closure activities as part of the safety and environmental plan; and
- Security and first aid personnel – in accordance with applicable laws and management plans.

Facts and Figures

Aboriginal peoples can be involved in a variety of areas in mine rehabilitation, monitoring, and management. The proper closure and rehabilitation of a site may involve ongoing treatment and maintenance. As such, site monitoring and assessment are needed to minimize risks to the community and the environment. As the community members are sometimes located near a site, they are often in a better position to monitor, manage, and assess it.

Contractors are the main employers for these activities. They usually make arrangements to hire qualified local personnel for decommissioning and reclamation activities. A small number of employees may be kept on to supervise these activities.

Facts and Figures

Industry and governments have worked together to develop programs to provide training, skills, and opportunities for laid-off employees. The skills an employee gains while working for a mining company may allow him or her to advance into other areas like trades, construction, medical technology, and administration.

Retraining

Environmental monitoring training can be provided to enable Aboriginal peoples to be involved in site assessment and reporting. Training can also be provided in the areas of community engagement and social capacity to ensure that rehabilitation plans and activities are in line with the values and interests of community members.

What Are the Other Economic Opportunities?

Mine closure offers few economic opportunities compared to other phases of the mine life. At the same time, by the time closure occurs, community businesses will be experienced in providing goods and services. Communities need to use innovation and creativity in order to capture the limited economic opportunities of closure.

Business opportunities related to closure activities include:

- Reclamation of the site;
- Planting trees;
- Establishing drainage systems;
- Water sampling and analysis;
- Possible ongoing water treatment;
- Dismantling transmission lines; and
- Ongoing site security.

It is vital that the community look beyond the closing of the mine for economic growth. Mine closure can usually be predicted, so communities can diversify and begin to develop new economic activities years before the mine closes. Whether the future economic base will be tourism, manufacturing, agriculture, or any other activity, sound planning and use of the community's skills base will be essential.

Many communities have gone through the closure process and there are great examples (Port Hardy, British Columbia; Elliot Lake, Ontario; and Kimberley, British Columbia) on how to diversify a mining-based community economy. Mine closure could represent an opportunity to use the skills and capacity gained from participating in the mineral development cycle for new beginnings.

4.8 Community Experiences: Polaris Mine Closure

The rich red buildings with a monster-sized Canadian flag on the roof contrasted against a carpet of snow served as a symbol of the modern age of Canadian mining for over 20 years. The Polaris mine was an example of vision, innovation, and success in Canada's North. While the discovery, construction, and operation of the mine is an amazing story, its closure and reclamation demonstrate excellent use of community input through consultation, water board processes, monitoring, and on-site work experience.

Background

The Polaris mine was an underground zinc-lead mine located on Little Cornwallis Island in Nunavut in the Canadian High Arctic. Polaris was the world's most northerly base-metal mine situated at about latitude 75° north and longitude 97° west, approximately 1400 kilometres from the North Pole. Resolute Bay is the nearest community about 100 kilometres to the southeast.

After 21 years of operation, Polaris stopped production in September 2002, as forecast, due to depletion of the orebody. A two-year, $53 million decommissioning and reclamation program was completed in September 2004.

Polaris was one of the most compact operations in Canada. Total land use was about 170 hectares. Surface facilities included a barge housing the concentrator, powerhouse, maintenance services, dryroom, warehouse, and operating offices; a concentrate storage building for 11 months' production; and an accommodation complex with housing for up to 220 personnel. Other facilities included a conveyor ship-loader system and an airstrip.

Mine Closure and Reclamation

After stopping commercial production in 2002, a major project was started to decommission the mine and reclaim the site. The goal was to complete the program by October 2004. A detailed closure plan was developed based on environmental site assessment work done in 1999 and 2000. After extensive regulatory and public consultations, Nunavut and federal authorities gave all approvals.

In September 2002, an on-site work force began demolishing buildings. In April 2003, the remediation of metals and hydrocarbon-contaminated sites began. Materials from the demolition

were placed in a surface rock quarry and capped. Most of the remaining equipment and materials were removed in September 2004.

A small camp, several sea containers of supplies, and some heavy equipment remain on site for touch-up work and to support ongoing monitoring programs.

SNC-Lavalin was the general contractor for the demolition of the structures and the clearing of the site. Gartner Lee Limited provided technical resources to assist the company in securing its closure approvals and to supervise the environmental remediation of the site.

The input on historical and future land use by local residents was used to develop site-specific soil quality remediation objectives.

Aboriginal Participation

The company actively sought the participation of the Nunavut community in the closure activities. Aboriginal engagement in the closure process consisted initially of consultation with communities that were affected by the process, specifically Resolute Bay and Grise Fiord.

Representatives traveled to the communities to present the drafts of the closure plans and to seek input and provide explanations of the process and procedures. The input on historical and future land use by local residents was used to develop site-specific soil quality remediation objectives. Local residents were invited to visit the site. The Nunavut Water Board also assigned a coordinator who spent time in the community while the plans were being developed. The coordinator then made a number of trips to the site during its implementation while the demolition and reclamation work was being carried out in order to keep residents informed of activities on the site.

Aboriginal Economic, Employment, and Business Opportunities

The tenders for contracts for work at the site had to include a northern content component, thereby assuring that some of the economic benefits for the contracts went to northern residents.

Qikiqtaaluk Corporation, an Inuit-owned firm, was retained as a sub-contractor of SNC-Lavalin to provide equipment operators, mechanics, and general labourers.

Local residents were also hired and trained to assist with the environmental site assessment and to assist Gartner

Lee Limited in guiding and assessing the effectiveness of the reclamation work in 2003.

Post-closure, local residents have assisted with the environmental monitoring of the site. They have also been retained by other mining companies as equipment operators and mechanics, and to monitor and guide environmental remediation activities.

For more information, visit www.teck.com.

Facts and Figures

Through training and experience, the skills acquired in the mining industry can be transferable to other economic activities, often within the same community.

Source: Natural Resources Canada.

GLOSSARY

Assayer
An analyst who performs chemical tests on samples of ore or minerals to determine their components.

Bankable (final) feasibility
A comprehensive analysis of a project's economics used by the banking industry for financing purposes.

Bond
A written agreement by which a mining company insures it will pay a certain sum of money if it does not perform certain duties properly, such as reclamation.

Bulk sampling
Removing mineralized rock in large quantities (frequently involving hundreds of tonnes) in order to do mineral processing tests.

Capital costs
Capital costs usually involve equipment and physical plant costs, and not consumable supplies such as fuel.

Commodity
Physical substances, such as metals, that can be sold or exchanged in a marketplace.

Consultation
Informative process that provides an opportunity for Aboriginal peoples to communicate meaningful feedback about mining projects and have this feedback acted upon by mining companies or government.

Crown land
Land owned by all Canadians that is administered and regulated by government (surface and mineral rights).

Expenditures
The amount of money spent to carry out exploration activities on a property.

Feasibility
The analysis that determines whether or not a mine would pay for itself and bring economic benefits.

Geochemical sampling
A method that measures the chemical properties of soil, water, rock, or moss.

Geophysical survey
A scientific method of prospecting that measures the physical properties (e.g., magnetism, electrical conductivity) of rock formations.

Grade
The amount of valuable element in each tonne of ore, expressed as ounces per tonne for precious metals and as a percentage for other metals.

Impact and Benefit Agreement (IBA)
A contractual agreement, usually between an Aboriginal community or entity and a mining company.

Infrastructure
The basic facilities, equipment, roads, and installations needed for the functioning of a system, like a mine.

Joint venture (JV)
A partnership or conglomerate, often formed to share risk or expertise in relation to a particular project.

Jurisdiction
The territorial range of authority or control.

Legacy
Something handed down from an ancestor or predecessor or from the past.

Memorandum of Understanding (MOU)
A way of creating an understanding between a community and a mining or exploration company. The MOU defines the principles for working together for mutual benefit.

Metallurgical
Related to the process of extracting metals from the ore.

Mineral or mining claim
A right that grants a holder the exclusive right to search for and develop mineral substances within a given area.

Mineral rights
Rights to resources that lie beneath the earth's surface.

Mining or mineral lease
A legal contract for the right to work a mine and extract the mineral or other valuable deposits from it under prescribed conditions of time, price, rental, or royalties.

Monitoring
To keep close watch over; supervise.

Option
An agreement to purchase a property reached between the property vendor and some other party that wishes to explore the property further.

Ore
The naturally occurring material (rock) from which a mineral or minerals can be extracted at a profit.

Orebody
A mineralized mass whose characteristics and economic limits have been examined.

Reclamation
Restoration of mined land to its original contour, use, or condition.

Rehabilitate
Process used to repair the impacts of mining on the environment.

Saleable
Capable of being sold; fit for sale.

Shareholder
One who owns shares (certificates representing units of ownership) of stock in a corporation.

Showing
A mineral occurrence that has been located, but the extent of it is unknown.

Smelter
Where ore is processed (using heat) to produce metals.

Stakeholder
Any party that has an interest ("stake") in a project.

Sub-surface rights
Rights to resources that lie beneath the earth's surface.

Surface rights
Every right in land other than mineral/ sub-surface rights.

Sustainability
Capacity for being continued.

Tailings
Material rejected from a mill after most of the valuable minerals have been extracted.

Till
Unsorted sediment deposited directly by a glacier and not reworked by melt water.

Waste
Any substance that is useless or worthless.

Waste rock
Barren rock or mineralized material that is too low in grade to be economically processed.

ADDITIONAL RESOURCES

Federal Government Sites

Natural Resources Canada:
www.nrcan.gc.ca/home

Aboriginal Affairs and Northern Development Canada:
www.aadnc-aandc.gc.ca

Canadian Environmental Assessment Agency:
www.ceaa-acee.gc.ca/default.asp?lang=En&n=D75FB358-1

Department of Justice:
http://laws-lois.justice.gc.ca/eng/acts/C-15.2/index.html

Fisheries and Ocean Canada:
www.dfo-mpo.gc.ca/index-eng.htm

Links to Provincial and Territorial Ministries/Departments Responsible for Natural Resources and Mines

Newfoundland and Labrador: www.nr.gov.nl.ca/nr/mines/index.html

Quebec: www.mrn.gouv.qc.ca/english/mines

Ontario: www.mndm.gov.on.ca/mines/default_e.asp

Saskatchewan: www.er.gov.sk.ca

New Brunswick: www.gnb.ca/0078/minerals/index-e.aspx

Alberta: www.energy.alberta.ca/minerals/1084.asp

Manitoba: www.manitoba.ca/iem/mrd/index.html

Northwest Territories: www.iti.gov.nt.ca/mineralsoilgas/index.shtml

Nova Scotia: www.gov.ns.ca/natr/meb

Prince Edward Island: www.gov.pe.ca/finance/eam-info/dg.inc.php3

Yukon: www.emr.gov.yk.ca

Nunavut: www.edt.gov.nu.ca

Environmental Sites

www.pdac.ca/e3Plus

www.pdac.ca/pdac/good-practices.html

www.ccme.ca/about

National Mining Associations

The Mining Association of Canada: www.mining.ca/site/index.php/en

Prospectors and Developers Association of Canada: www.pdac.ca

Canadian Aboriginal Minerals Association: www.aboriginalminerals.com

Canadian Institute of Mining, Metallurgy and Petroleum: www.cim.org

Provincial and Territorial Mining Associations

British Columbia: www.amebc.ca/Home.aspx, www.mining.bc.ca

Yukon: www.yukonminers.ca

Alberta: www.acr-alberta.com

Northwest Territories and Nunavut Chamber of Mines: www.miningnorth.com

Ontario: www.oma.on.ca/en

Quebec: www.amq-inc.com, www.aemq.org, www.minalliance.ca

Nova Scotia: www.prospectors.ns.ca

Newfoundland and Labrador: www.miningnl.com

Saskatchewan Mining Association: www.saskmining.ca

Prospectors Assistance Programs

Manitoba: www.manitoba.ca/iem/mrd/busdev/incentives/mpap-toc.html

Quebec: www.mrn.gouv.qc.ca/ministere/affaires/affaires-autochtones.jsp

Career Opportunities in the Mining Industry

www.mihr.ca/en

Aboriginal Business

www.native-invest-trade.com/index_basic.shtml

www.ccab.com

www.aadnc-aandc.gc.ca/eng/1100100032796/1100100032800

http://metisportals.ca/ecodev

www.aadnc-aandc.gc.ca/eng/1100100032802/1100100032803

Impact and Benefit Agreements

www.ibacommunitytoolkit.ca

www.miningguide.ca

www.nrcan.gc.ca/minerals-metals/aboriginal/bulletin/3747

Duty to Consult

Aboriginal Affairs and Northern Development Canada:

www.aadnc-aandc.gc.ca/eng/1100100014664

Land Claims and Self-Governing Agreements

The Agreement Concerning a New Relationship (Paix des Braves) Between Le Gouvernement du Québec and the Crees of Quebec (in English):
www.gcc.ca/pdf/LEG000000008.pdf

Nisga'a Final Agreement:
www.aadnc-aandc.gc.ca/eng/1100100031292

Umbrella Final Agreement Between the Government of Canada, the Council for Yukon Indians and the Government of the Yukon:
www.aadnc-aandc.gc.ca/eng/1297278586814

Indian Mining Regulations

http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.,_c._956/index.html

Notes

Notes